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TECHNOLOGY

COMMERCIALIZATION

PROCESS

HANDBOOK

Introduction

This handbook

- ***defines the overall technology commercialization process;***
- ***provides guidelines for programs and projects; and***
- ***is intended to provide an awareness of and encourage your participation in Technology Commercialization.***

In today's increasingly competitive global economic climate, the U.S. must ensure that its technological resources are fully utilized throughout the economy. This portends a new, broader role for NASA. To ensure that NASA's technology assets and know-how contribute to U.S. economic growth, it is critical that they are quickly and effectively translated into improved production processes and marketable, innovative products. Accomplishing these objectives requires the agency to develop new ways of doing business and new ways of measuring its progress.

NASA's Strategic Plan and 'Agenda for Change" have elevated the importance of its technology commercialization mission, making it comparable to NASA's aerospace missions. In addition, NASA has established the NASA Commercial Technology Management Team (NCTMT) which oversees the Technology Commercialization process and has established the NASA Commercial Technology Network (NCTN) as a primary resource.

NASA has traditionally measured its progress in terms of technical performance, cost and schedule. Now, in the post-Cold War era, there is another measure which is the contribution of technology to national economic security. In response, a strong emphasis on forming R&D partnerships with the private sector is the foundation of a new way of doing business for NASA. To realize NASA's goal, the agency will strive to conduct business like any other industrial partner when working with U.S. industry. NASA will set new standards for government commercial practices in terms of effectiveness, efficiency and timely customer responsiveness.

This handbook:

- Discusses why technology commercialization is important to the nation, to NASA, and to individual NASA employees;
- Defines the overall technology commercialization functional process;
- Provides program and project managers an overall guideline for implementing their technology commercialization responsibilities under NPG 7120.5A;
- Defines the points of contact for assistance;
- Identifies where you can get additional information; and
- Will be updated periodically. Please refer to NASA Headquarters Commercial Technology home page for updates: URL: http://www.nctn.hq.nasa.gov

Technology Transfer History

Under NASA's authorizing legislation, the National Aeronautics and Space Act of 1958 (the Space Act), as amended, 42 U.S.C. § 2451 et seq, NASA is directed to conduct its activities so that they contribute to the preservation of the role of the United States as a leader in aeronautical and space science and technology and their applications. The Space Act directs the Administrator to carry out the following functions:

- Plan, direct and conduct aeronautical and space activities;
- Arrange for participation by the scientific community in planning scientific measurements and observations to be made through use of aeronautical and space vehicles, and conduct or arrange for the conduct of such measurements and observations;
- Provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof;
- Seek and encourage, to the maximum extent possible, the fullest commercial use of space; and
- Encourage and provide for Federal Government use of commercially provided space services and hardware, consistent with the requirements of the Federal Government.

Congress granted NASA very broad authority to carry out the above functions. The Administrator is authorized to enter into and perform such contracts, leases, cooperative agreements, or other transactions as may be necessary in the conduct of its work and on such terms as it may deem appropriate, with any agency or instrumentality of the United States, or with any State, Territory, or possession, or with any political subdivision thereof, or with any person, firm association, corporation or educational institution. In addition, section 205 of the Space Act permits the Administrator to engage in international cooperative programs pursuant to its mission. Under its Space Act authority, NASA has entered into a great number of partnering agreements with diverse groups of people and organizations in order to meet wide-ranging NASA mission and program requirements and objectives.

Over the past two decades, the Federal Government has drastically changed its approach to the management of the technologies created by its research and development organizations.

Early in its history, NASA achieved technology transfer with the aerospace community through joint Research and Development (R&D) efforts, technical papers, participation in technical societies, and through funding graduate level research and development. While these mechanisms effectively transferred technology to the aerospace community, many of the technologies had non-aerospace applications that were not being pursued. To address this, NASA established the Technology Utilization (TU) Office to facilitate the transfer of technology from the government to the private sector. The legislation, as a whole, promotes the vesting of exclusive rights in government -funded technology with the private sector to encourage the private investment of commercialization funds. The most pertinent legislation is described below.

For many years U.S. policy promoted the unrestricted dissemination of the scientific and technical information produced by the Federal laboratories, with little concern for the role of intellectual property protection in encouraging the commercial development of inventions. Consequently, U.S. companies were sometimes unwilling to turn federally funded technologies into commercially attractive products and processes. In cases where the private sector company would have to commit its own resources to develop the final products, the lack of exclusive rights provided by intellectual property protection made companies reluctant to commercialize federal technology. To address this concern, major legislation was enacted. The legislation, as a whole, promotes the vesting of exclusive rights in government-funded technology with the private sector to encourage the private investment of commercialization funds. The most pertinent legislation is described on the following page.

Major Technology Transfer Legislation

The following list highlights some of the more recent legislation relevant to technology transfer and commercialization of federally funded technologies. Although NASA transfers technology under its Space Act authority, the following legislation also applies to NASA.

Chiles Act of 1978 (Public Law 97-258)

The "Chiles Act" (31 U.S.C. 6301 et seq.), defines assistance instruments, the purpose of which are to transfer a thing of value from the Federal Government to a State, a local government or private entity to carry out a public purpose of support or stimulation.

Stevenson-Wydler Technology Innovation Act of 1980 (Public Law 96-480)

The Stevenson-Wydler Technology Innovation Act of 1980 made the transfer of federally owned or originated technology to state and local governments, and to the private sector, a national policy and the duty of each federal laboratory. The purpose of the Stevenson-Wydler Act was the renewal and expansion of mechanisms to foster and encourage cooperation among academia, federal laboratories, and industry in technology transfer, personnel exchanges, and joint research projects. Since passage of the Stevenson-Wydler Act, Federal agencies have been required to have a formal Technology Transfer program.

Bayh-Dole Act of 1980 (Public Law 96-517)

The Bayh-Dole Act of 1980 enabled small businesses and nonprofit organizations (including universities) to secure intellectual property rights to the inventions they produced in performing federally funded R&D. The Bayh-Dole Act further protects intellectual property rights in inventions by authorizing Federal agencies to withhold information on inventions from public disclosure and from disclosure under the Freedom of Information Act. The results of this innovative approach led to increased efforts by universities to report inventions and licenses.

Trademark Clarification Act of 1984 (Public Law 98-620)

The Trademark Clarification Act of 1984 permitted contractors to receive patent royalties for use in R&D, awards, or for education; permitted private companies, regardless of size, to obtain exclusive licenses; and permitted university and nonprofit laboratories to retain patent title.

Federal Technology Transfer Act of 1986 (Public Law 99-502)

The Stevenson-Wydler Act was broadened and strengthened by the Federal Technology Transfer Act of 1986. The Federal Technology Transfer Act built on the changes of the Bayh-Dole Act and authorized Federal labs, which did not previously have the authority, to enter into R&D partnerships with U.S. industry. The vehicle for these partnerships is the Cooperative Research and Development Agreement (CRADA). The law permits private parties and Federal laboratories to contribute personnel, property, and services to implement agreements. Private parties can contribute funding but Federal laboratories cannot contribute funds. The Federal Government retains the right to manufacture and to use the technology developed, royalty-free, for Government purposes. Additionally, the Federal Technology Transfer Act made technology transfer a responsibility of every federal laboratory scientist and engineer and mandated that technology transfer responsibilities be considered in laboratory employee performance evaluations. The Act also established the principle of royalty sharing for federal inventors (15% minimum) and set up a reward system for other innovators. The Act encourages federal laboratories to engage in technology transfer activities by allowing them to retain the balance of royalties from the licensing of inventions after the inventors are paid their share.

Prior to the passage of the Federal Technology Transfer Act, NASA relied on the Space Act as the authority for entering into cooperative agreements with industry. Due to its added flexibility, NASA has made a policy decision to continue using the Space Act as its authority for entering into agreements with industry.

Executive Order 12591 Facilitating Access to Science and Technology of 1987

The Executive Order Facilitating Access to Science and Technology of 1987 reflected Presidential support for the federal effort to promote technology transfer by ordering executive departments and agencies, to the extent permitted by law, to facilitate the transfer of technology from the Federal government to state and local governments, universities, and the private sector, particularly small businesses. It also established the Technology Share Program and a scientist and engineering exchange program.

1978 Chiles Act

1980 Stevenson-Wydler Technology Innovation Act

1980 Bayh-Dole Act

1984 Trademark Clarification Act

1986 Federal Technology Transfer Act

1987 Executive Order Facilitating Access to Science and Technology

1988 Omnibus Trade and Competitiveness Act

1989 National Institute of Standards and Technology Authorization Act

1989 National Competitiveness Technology Transfer Act Technology

1995 National Technology Transfer and Advancement Act of 1995

Omnibus Trade and Competitiveness Act of 1988 (Public Law 100-418)

The Omnibus Trade Act of 1988 placed emphasis on the need for public/private cooperation on assuring the full use of research results. It also authorized the start of the regional centers as outlets for the demonstration of technology to small and medium sized firms.

National Institute of Standards and Technology Authorization Act of 1989 (Public Law 100-519)

The National Institute of Standards and Authorization Act of 1989 made software development innovations eligible for awards.

National Competitiveness Technology Transfer Act of 1989 (Public Law 101-189)

The National Competitiveness Technology Transfer Act of 1989 (included as Section 3131 et seq. Of DOD Authorization Act for FY 1990) further amended the Stevenson-Wydler Technology Innovation Act of 1980 to enhance Technology Transfer between the Federal Government and the private sector. It empowered contractor-owned Government laboratories to enter into CRADAs, and allowed information and innovations brought into, and created through, CRADAs to be protected from disclosure.

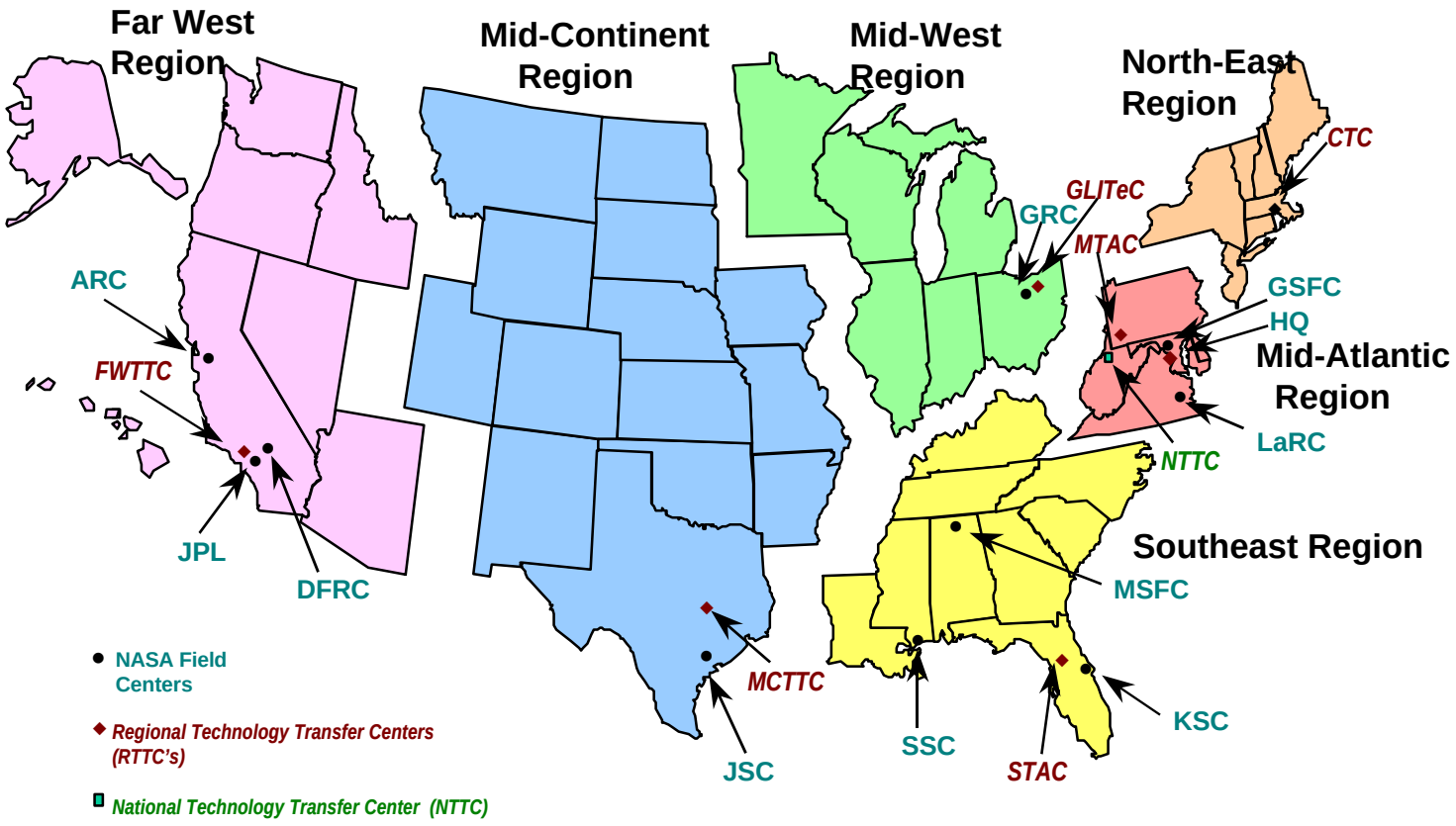
National Technology Transfer and Advancement Act of 1995 (Public Law 104-113)

The National Technology Transfer and Advancement Act of 1995 amends the Stevenson-Wydler Technology Innovation Act and the Federal Technology Transfer Act to further promote commercialization of inventions resulting from CRADAs by providing private sector partners sufficient Intellectual Property rights in inventions. The Act guarantees the partner, at minimum, the option of an exclusive license in a field of use for inventions created solely or jointly with Government employees. The Act assures that privileged and confidential information will be protected from public disclosure when a CRADA invention is used by the Government. The Act also provides enhanced incentives and rewards to Government employees who create inventions that are commercialized. The Act provides the inventor(s) with the first $2000, and thereafter at least 15%, of the royalties received yearly, up to a maximum of $150,000 per year per inventor. The Act further permits an Agency to use royalty revenue for R&D consistent with missions and objectives of its laboratories and for related administrative and legal costs.

NASA Commercial Technology Network

Recognizing the challenge that technology commercialization represents, the NASA Commercial Technology Network (NCTN) was established to assist NASA programs, projects, researchers, contractors, grantees and recipients. The NCTN is dedicated to the timely transfer of scientific advances and technologies resulting from NASA's aeronautics and space programs and other Federal Research and Development (R&D) to commercial applications throughout the United States economy. The key NCTN components are:

- NASA Center Commercial Technology Offices;
- Regional Technology Transfer Centers (RTTCs);
- National Technology Transfer Center (NTTC);
- Technology/Business Incubators; and
- NASA TechTracS—an agency-wide technology transfer commercialization management system.



NASA Field Centers

Each NASA Center has a Commercial Technology Office to coordinate and manage a full range of technology commercialization activities, including new technology reporting, technical assistance, cooperative projects, and industry outreach. The table below shows the points of contact for each center's Commercial Technology Office.

Regional Technology Transfer Centers

NASA's six Regional Technology Transfer Centers (RTTCs) help U.S. firms access, assess and acquire NASA and other federally funded technologies for commercial and industrial applications. As part of the national network, the RTTCs are aligned with the six Federal Laboratory Consortium regions. The RTTCs are staffed by technology transfer experts offering technical consultation services and access to other experts in the field. The RTTCs provide services to industries within their designated regions and assist industry clients to locate, assess, and commercialize technologies from NASA and the Federal R&D base.

Operating since January 1992, the RTTCs have developed a regional network that involves more than 70 affiliated organizations at the state and local levels, enabling them to provide invaluable assistance to U.S. companies. RTTC services include technology sourcing, technology/market analysis and the development of technology transfer and commercialization projects and agreements. The RTTCs provide technical, commercial and general assistance to several thousand customers every year.

Refer to Appendix A for a detailed description of the RTTCs.

Commercial Technology Offices--Points of Contact

Ames Research Center 650-604-0893 http://ctoserver.arc.nasa.gov/	**Johnson Space Center** 281-483-0474 http://technology.jsc.nasa.gov/	**Marshall Space Flight Center** 256-544-4266 http://www.nasasolutions.com/
Dryden Flight Research Center duke@louie.dfrc.nasa.gov	**Kennedy Space Center** 407-867-6224 http://technology.ksc.nasa.gov/	**NASA Headquarters** 202-358-2320 http://www.nctn.hq.nasa.gov/index.html
Goddard Space Flight Center 301-286-5810 http://afc.gsfc.nasa.gov/ocp/ocphome.html	**Langley Research Center** 757-864-6006 http://tag-www.larc.nasa.gov/	**Stennis Space Flight Center** 228-688-1914 http://technology.ssc.nasa.gov
Jet Propulsion Lab 818-354-2577 http://techtransfer.jpl.nasa.gov/	**Glenn Research Center** 216-433-3484 http://cto.grc.nasa.gov/	**National Technology Transfer Center (NTTC)** 1-800-678-6882 http://www.nttc.edu
Northeast RTTC **Regional Technology Transfer Center** 508-870-0042 http://www.ctc.org	**Southeast RTTC** **Regional Technology Transfer Center** 352-294-7822 http://www.4stac.org	**Midwest RTTC** **Regional Technology Transfer Center** 440-486-2233 http://www.battelle.org/glitec
Far West RTTC **Regional Technology Transfer Center** 213-743-2353 http://www.usc.edu/dept/engineering/TTC	**Mid-Atlantic RTTC** **Regional Technology Transfer Center** 412-383-2500 http://www.mtac.pitt.edu	**Mid-Continent RTTC** **Regional Technology Transfer Center** 409-845-8762 http://www.tedd.org

The National Technology Transfer Center

The National Technology Transfer Center (NTTC) enhances U.S. industry's economic competitiveness by linking it to NASA and federal technological resources. Located at Wheeling Jesuit University in Wheeling, West Virginia, NTTC has been part of the NASA Commercial Technology Network since 1991.

NTTC fosters NASA and federal technology transfer with U.S. businesses through its National Gateway. This service provides businesses with rapid access to NASA and other federal technologies, expertise and facilities. NTTC's on-line services support the National Gateway. The NTTC World Wide Web site features a comprehensive directory of NASA and federal R&D laboratories and highlights NASA and federal technologies available for commercialization. It also maintains information on solicitations for programs, including the Small Business Innovation Research (SBIR) program, the Small Business Technology Transfer (STTR) program and the Advanced Technologies Program (ATP).

NTTC emphasizes design and implementation of training in technology transfer and innovation management. NTTC's training activities include the National Industrial Extension Agents Curriculum and projects with NASA's Office of Aeronautics, the U.S. Navy's Office of Naval Research and the Environmental Protection Agency.

NTTC conducts national outreach and promotional activities to improve private sector awareness of federal technology resources and opportunities. Overall, NTTC's activities and services are designed to complement and enhance NASA technology transfer programs across the nation.

More information about National Gateway, training courses and other services is available at the NTTC's World Wide Web site at URL: http*://www.nttc.edu or telephone 1-800-678-6882*.

NASA Technology Business Incubators

A technology/business incubator is a facility designed and operated to nurture the development of new or early-stage business enterprises or "client firms" of the incubator. The client firms generally are tenants physically present in the incubator facility for a period of time up to about two years. However, client firms of the incubator are not necessarily physically located or co-located within the incubator. The incubator must have a physical facility where client firms can obtain ordinary and necessary business services on-site and in which client firms are provided office, conference, laboratory, and/or other physical space on a fee or other basis under well-defined terms.

NASA incubators are technology-based and provide small high technology firms in the start-up phase with a wide array of support services necessary to commercially apply NASA-developed technology. Accordingly, the incubator will provide client firms with services for an affordable fee or other basis, which include assistance with:

- Access to laboratory and other technical resources for purposes of engineering prototyping, production prototyping, testing, analysis, and other essential R&D support, product development, and accessing other technical expertise.
- Business plan development.
- Market research and market analysis.
- Establishing initial manufacturing operations.
- Establishing product distribution and other sales operations.
- Access to business consulting, legal, accounting, tax, insurance, and other financial expertise to include networking with non-institutional private investors, venture capitalists, and within the money markets and capital markets sectors.
- Free or low cost access in the start-up phase to necessary business office and manufacturing operations equipment and facilities.
- Access to training, particularly with regard to business plan development, venture analysis, management and organization techniques, computer skills, computer financial accounting and other business systems design, networking in sectors critical to the client firm's business operations, regulatory compliance, and available information resources relevant to the client firm's particular business.
- Access to free or low-cost college and university scientific, engineering, and business development expertise.

Electronic Network/NASATechTracS

One of the key goals in the *Agenda for Change* was to use the Internet/Intranet in an innovative fashion to support the NASA commercial technology mission. In 1994, the Electronic Network was established as a single NASA interface that provides:

- an *integrated information resource* for NASA technology commercialization that is freely available to the U.S. public and industry;
- an *electronic marketplace and marketing means* for NASA technology, facilitating communications and partnering with U.S. firms and industry; and,
- an *Intranet* for the management and operation of the Commercial Technology Program.

One of the Electronic Network's core components is NASATechTracS. NASATechTracS is the agency-wide technology commercialization data and process management system. Every Center's Commercial Technology Office has a NASATechTracS system. NASATechTracS supports every step of the process and is available to every program/project manager to assist him or her in carrying out their technology commercialization responsibilities. The Commercial

Technology Office will assist the NASA program/project manager in obtaining access to, and utilization of, NASATechTracS.

In addition to NASATechTracS, the on-line NCTN currently encompasses over 20 Web sites operated by NASA's national network of programs, Centers and offices sponsored by, and affiliated with, the Commercial Technology Program. The NCTN web site (http://www.nctn.hq.nasa.gov) operated by the Commercial Technology Division at Headquarters serves as the gateway and core resource for the network.

These websites provide a wealth of knowledge on technologies available for Commercialization.

Many of these sites are connected to other sites that provide additional information.

The dissemination of this information is key to the future of our economy.

- **NASA Commercial Technology Network:** This site provides the viewer with information on moving technology from the lab to the marketplace.
  URL: http://www.nctn.hq.nasa.gov.

- **NASATechTracS Tech Finder:** This site provides the viewer with a database containing a wealth of information on technologies developed by NASA that may have commercial potential and benefits.
  URL: http://technology.nasa.gov/.

- **1996 NASA Strategic Plan** - This site provides the strategic outlook for NASA. URL: http://www.hq.nasa.gov/office/nsp/NSPTOC.html.

- **NASA Tech Briefs** - This site provides the viewer the ability to subscribe to Tech Briefs, search NASA briefs archived over the last 20 years, review resource reports, technical support packages and NASA patent abstracts. URL: http://www.nasatech.com/.

- **Aerospace Technology Innovation:** This site provides on-line information on NASA projects and opportunities in the areas of technology commercialization, aerospace technology development and the commercial development of space.
  URL: http://nctn.hq.nasa.gov/innovation/index.html.

- **NASA Spinoffs:** This website contains information on NASA technologies that have been successfully commercialized by private industry companies.
  URL: http:www.sti.nasa.gov/tto/spinoff.html.

Policy

It is NASA policy to proactively pursue commercialization of technology to impart to the maximum extent possible, the benefits of its technological assets to the national economy.

"The quality of life for all Americans stands to improve if we...make smart decisions about technological investments and work effectively with private sector partners."

Daniel S. Goldin

Administrator, National Aeronautics & Space Administration

National Policy

The President in his report, "Technology for America's Economic Growth, A New Direction to Build Economic Strength," states:

American technology must move in a new direction to build economic strength and spur economic growth. The traditional federal role in technology development ... was appropriate for a previous generation but not for today's profound challenges ... The nation urgently needs improved strategies for government/industry cooperation in the support of industrial technology.

The fundamental mechanism for carrying out this new approach is research and development partnerships between Government and industry.

NASA Policy

It is NASA policy to proactively pursue commercialization of technology and to impart, to the maximum extent possible, the benefits of its technological assets to the national economy. NASA's 1998 "Strategic Plan" and 1994 "Agenda for Change" recognize the importance of the commercial technology mission and view commercialization as important as any mission in the agency.

NASA's "Agenda for Change" is the blueprint for achieving this mission. The cornerstones of this policy are:

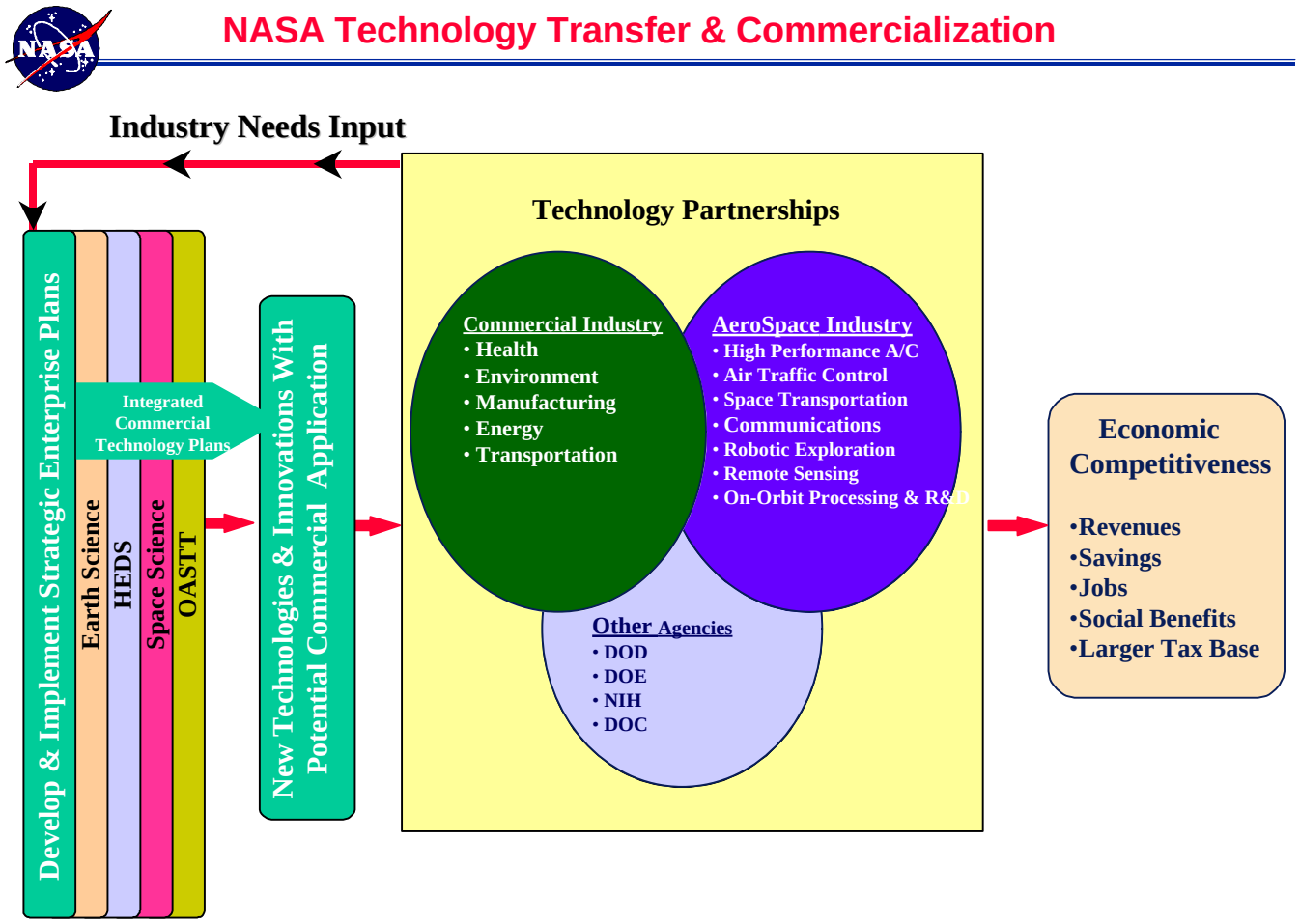
- Devoting 10 to 20% of its budget to R&D partnerships with the private sector;
- Initiating partnerships that allow the flow of technology, including dual-use, industry-led, and commercial technology acquisition partnerships;
- Expanding participation of small, small disadvantaged, and women-owned small businesses;
- Securing alliances with state, local, and regional governments to stimulate and accelerate NASA contributions to local, regional, and state economic development;
- Requiring plans for the commercialization of developed technologies in all applicable NASA procurements; and
- Seeking non-aerospace partners for R&D collaborations.

In addition to NASA's Agenda For Change, the "NASA Program and Project Management Processes and Requirements Document" (NPG 7120.5A), also acknowledges technology commercialization as integral and priority elements of all NASA programs and projects. NASA's approach is to proactively focus on technology commercialization from the very start of a program/project--so as to maximize the potential commercial utilization of NASA technologies and innovations. As can be seen in the figure on the following page, achieving this goal requires participation of not only our traditional aerospace partners but also the non-aerospace community.

The following is a list of NASA policy and guidance documents that relate to technology commercialization:

- NPD 1000.1, NASA Strategic Plan.
- NPG 1000.2, NASA Strategic Management Handbook.
- NPG 7500, NASA Technology Commercialization Process Document
- NPG 7120.5, NASA Program and Project Management Processes and Requirements.
- NPD 2091.1, Inventions Made by Government Employees.
- NPD 2092.1, Royalties and other Payments Received by NASA from the Licensing of Patents and Patent Applications.
- NPD 2110.1, Foreign Access to NASA Technology Transfer Material
- NPD 2210.1, External Release of NASA Software

- NPG 1050.xx, Space Act Agreements.
- NPD 1090.xx, NASA Communicate Knowledge Process Policy for Programs and Projects.
- NPG 1090.xx, Requirements for Communicating NASA's Knowledge from Programs and Projects.



NASA Commercial Technology Management Team

The NASA Commercial Technology Management Team (NCTMT) is responsible for overseeing the technology commercialization process and has established the NASA Commercial Technology Network (NCTN) as a primary resource for assisting program/project managers. The NCTMT consists of the Commercial Technology Office manager from each of the NASA Centers and a representative from each of the NASA strategic enterprises.

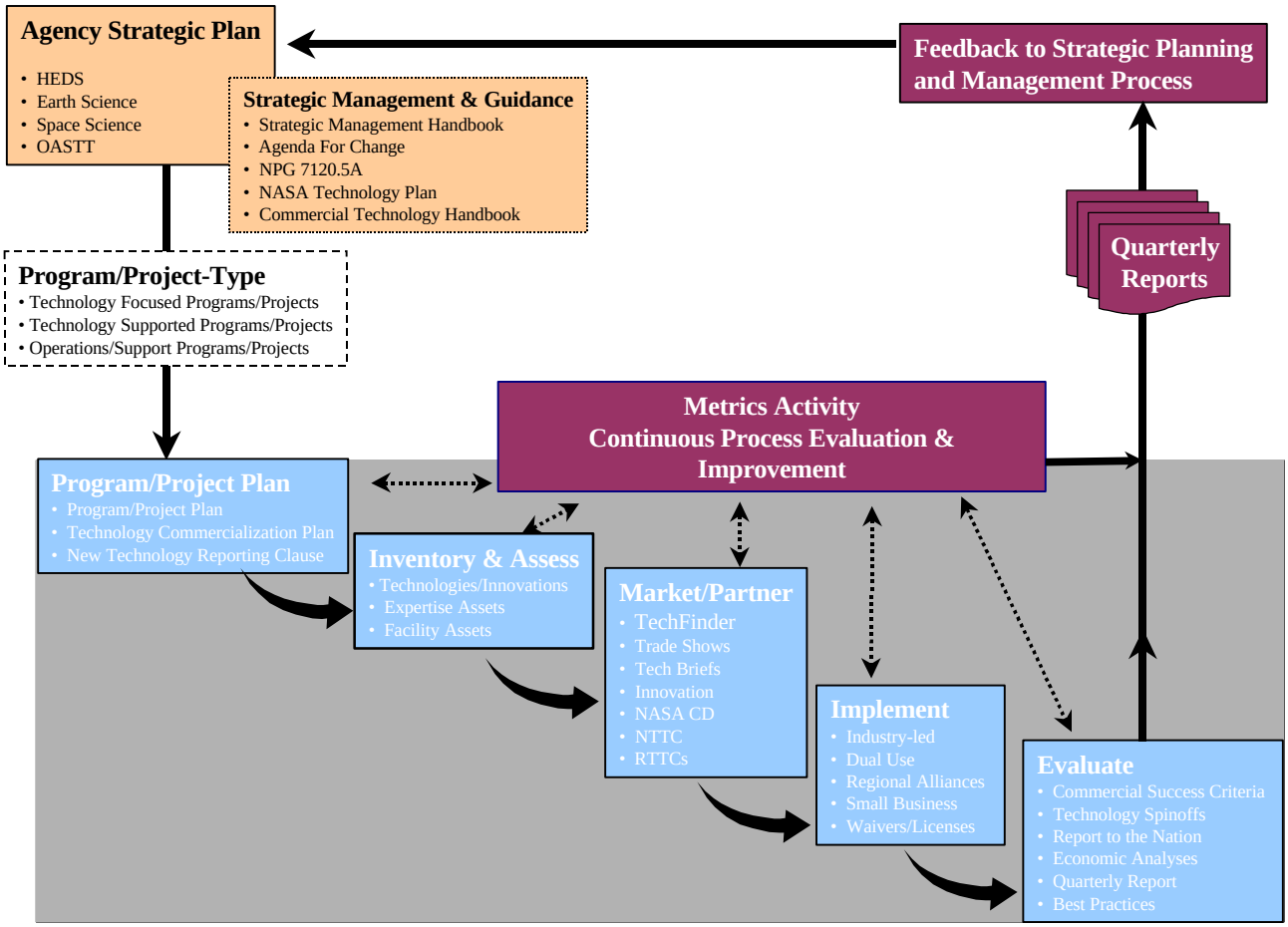
Process Overview

All NASA programs and projects are subject to the Commercial Technology Process and the process's end objective for each program/project is the same—that of maximizing each program/project's commercial impact.

NASA's Commercial Technology Process introduces a new way of doing business that involves a mix of practices/mechanisms which enable the Agency to more closely align its way of doing business with that of the private sector. The common denominator in these practices is technology partnerships. Technology partnerships are business arrangements among the government, industry, and/or academia wherein each party commits resources to the accomplishment of agreed-to objectives and shares the risks and rewards of the endeavor. By the end of FY 1998, NASA shall measure the extent of its technology partnerships with industry against the National Performance Review goal of 10 percent to 20 percent of the NASA R&D budget. This goal is not a tax or set-aside. It does not aim at doing 10 percent to 20 percent more work by adding industry R&D objectives; instead, it aims at achieving 10 percent to 20 percent of NASA's mission and technology objectives in a new and different way through commercial partnerships.

All NASA programs and projects are subject to the Commercial Technology Process and the process's end objective for each program/project is the same—that of maximizing each program/project's commercial impact. As shown in the figure below—NASA's Commercial Technology Process is not a stand-alone process. It is integral to and is accomplished within the agency's overall strategic planning and management process. This includes the agency's program/project management process (NPG 7120.5A), as well as, NASA's technology planning process.

Simplified NASA Commercial Technology Process



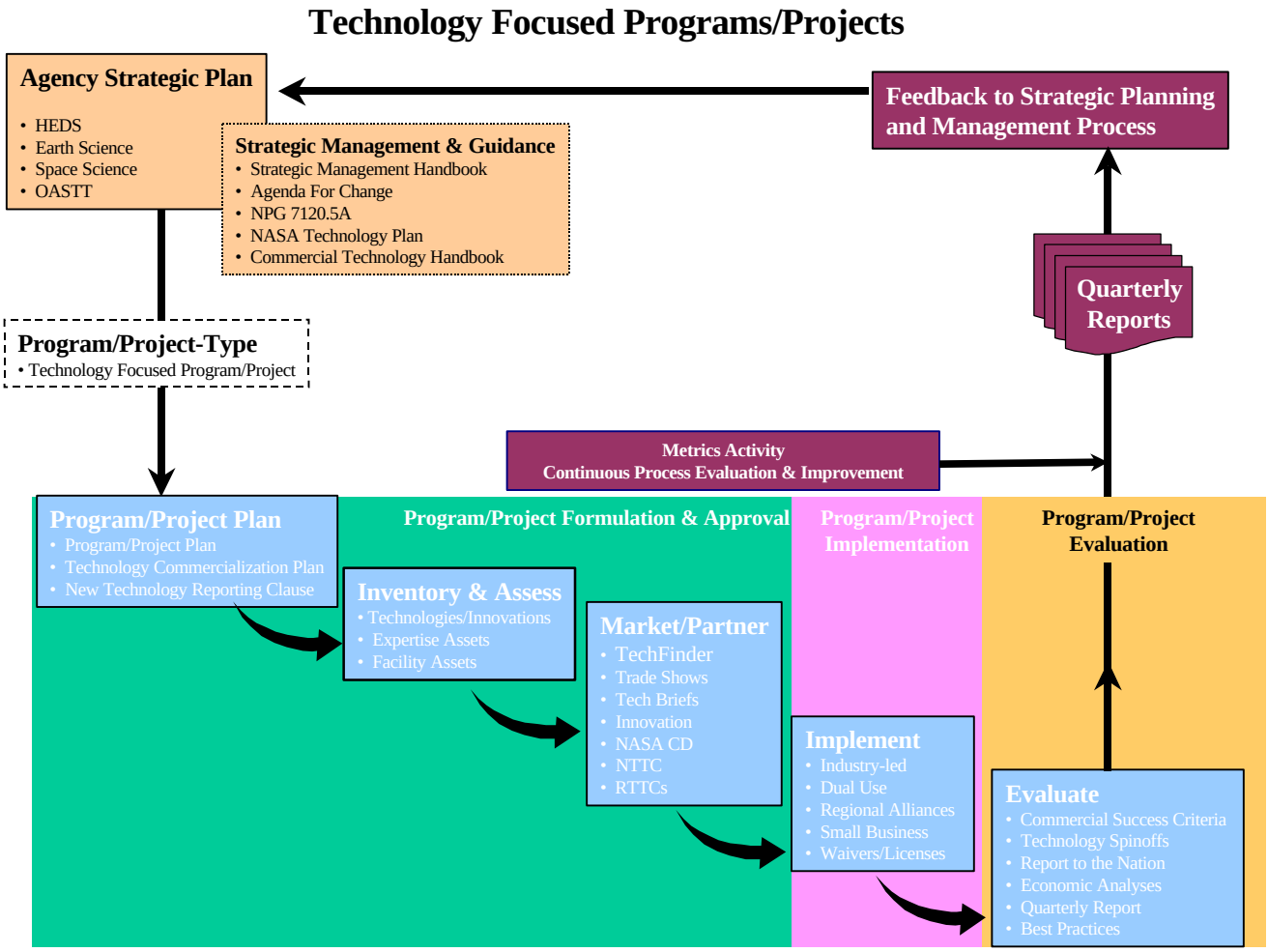
Thus a program/project will implement the commercial technology process as an integral part of the overall program/project's formulation, approval, implementation, and evaluation sub-processes. However, which elements of the

commercial technology process are performed under what specific program/project management sub-process, will depend upon the type of program/project. For purposes of NASA's Commercial Technology Process there are three types of programs/projects:

- Technology Focused Programs/Projects
- Technology Supported Programs/Projects
- Operations/Support Programs/Projects

Technology Focused Programs/Projects

The primary or sole purpose of these programs/projects is to develop and advance technology. Unless justified otherwise, these programs are required to develop and finalize technology commercialization partnerships prior to program/project approval. Indeed, all work authorization agreements between Enterprise Administrators and Field Center Directors for technology focused programs/projects shall identify those areas requiring new technology development with commercial potential. Strong consideration should be given to appropriate partnership arrangements with the commercial sector in conducting the resulting R&D. these partnerships should result in commercial applications creating new products, processes, or services. Appropriate deliverables and metrics should be identified and progress toward achieving these commercial objectives should be included in authorization reports. The figure below shows how the commercial technology process will likely be implemented within the overall program/project management process for technology focused programs/projects.



There are numerous partnership mechanisms available to the program/project including:

- Contractor Technology Commercialization—commercialization of technologies developed under NASA procurement contracts, grants, and cooperative agreements.
- Industry-Led Partnerships—the formation, funding, and implementation of industry-initiated and -led partnerships with NASA to develop aeronautics and space technologies, including dual-purpose technologies.
- Commercial Product Development—industry-led development of commercial products and services from space.
- Dual-Purpose Technology Development—NASA technologies development with dual-purpose applications in the aeronautics/space industry as well as in the non-aerospace commercial industry.
- Small Business Development—the formation, growth, and accelerated development of small business by bringing together the five essential contributing business success factors: technology, talent, capital, business know-how, and market need.
- Regional Alliances—alliances with state and local governments, and other Federal agencies, to stimulate and accelerate NASA partnerships with local, regional, and state economic development, to identify opportunities for fostering commercialization, and especially to provide opportunities to small and disadvantaged businesses.

Additional information on partnerships can be found in the "NASA Partnership Agreements" section of this handbook on page 24.

The Contractor Technology Commercialization practice merits close attention since over 80 percent of NASA resources are invested in contracts with the private sector. NASA will determine where the rights to commercialize Agency-funded technology shall reside. However, most rights to commercialize NASA-funded technology reside with contractors. Partnerships with non-aerospace companies will likely be necessary in order to fully leverage these technologies into all their potential commercial applications. If successful, the American public would derive significant technology commercialization benefit from the work of NASA contractors.

When contractors are used in a technology focused program/project the NASA program/project manager shall seek innovative approaches and mechanisms to increase NASA contractor commercialization of technology derived from their work for NASA. Approaches include commercialization considerations during contractor selection, contract implementation, and contract closeout, including such devices as commercialization performance provisions in statements of work and an appropriate percentage of award fee criteria tied to commercialization efforts. Requests for Proposals (RFPs) should be structured in a manner that provides a direct relationship between NASA's mission and technology commercialization plans when appropriate. This can be accomplished by encouraging contractors to develop technologies with potential for commercial application and to submit plans for the transfer of such technologies to the commercial marketplace. These approaches shall extend to support service contracts as appropriate, as well as material and service prime contracts. When appropriate, they shall also be required, by "flow down," of subcontractors.

Technology Supported Programs/Projects

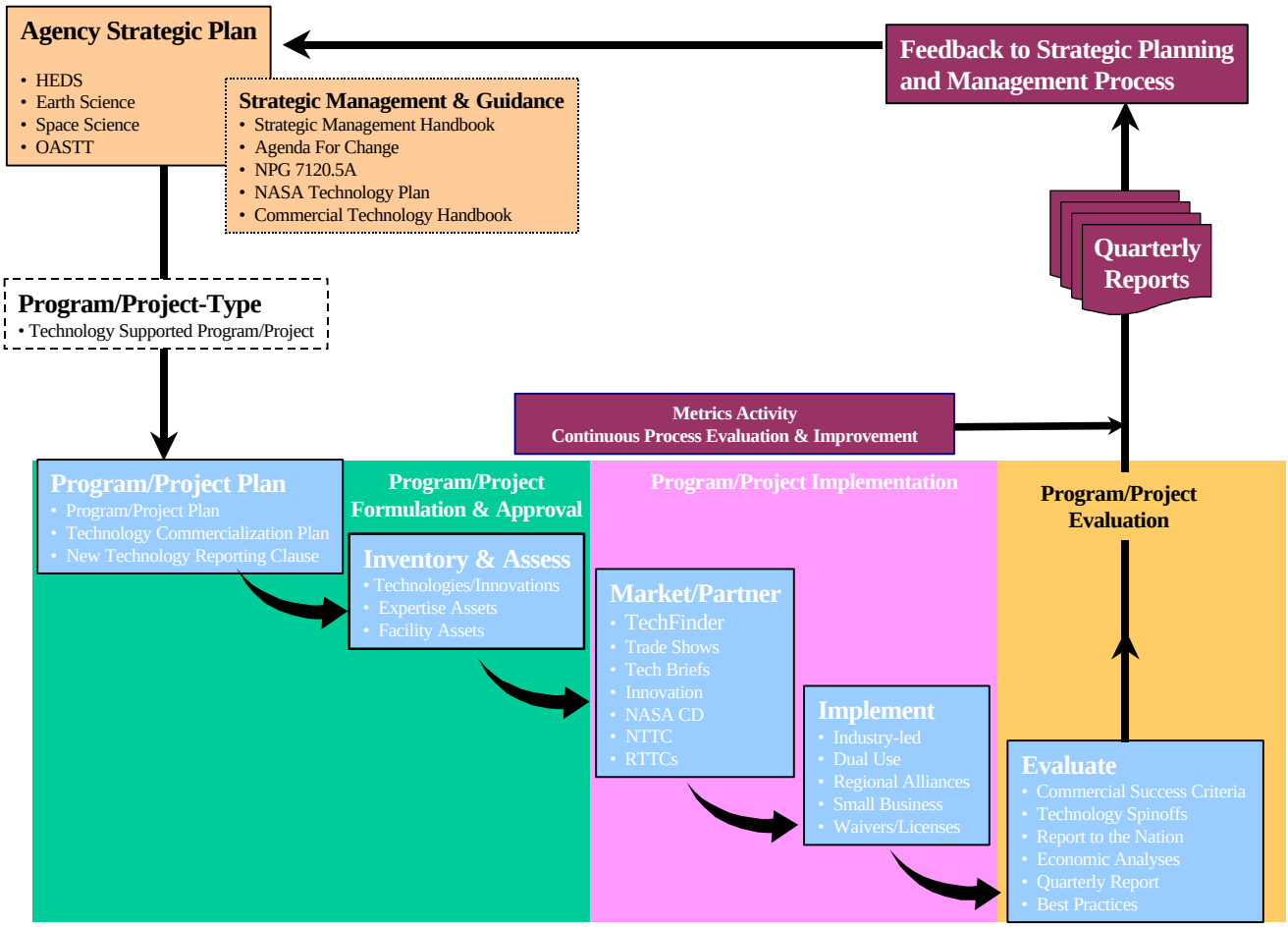
As discussed earlier, these programs do not have technology development as their sole or primary mission but are Usually focused on a scientific or exploration endeavor to which some technology development may be necessary. While these programs/projects are not necessarily expected to develop and finalize partnerships prior to their approval, they are expected to implement technology partnerships shortly after program/project approval and certainly before program completion. Thus virtually all of the processes described above for technology focused programs/projects are applicable to technology supported programs/projects. The figure on the following page shows how the commercial technology process is likely to be implemented within the overall program/project management process by technology supported programs.

Because of their nature two additional partnership mechanisms are to be considered as part of the overall Commercialization strategy:

- Commercial Technology Acquisition—the acquisition and use of commercial technologies in NASA projects and programs: those that are currently available in the marketplace and those that can be made available by commercial industry in the future, based on the knowledge of planned NASA requirements.

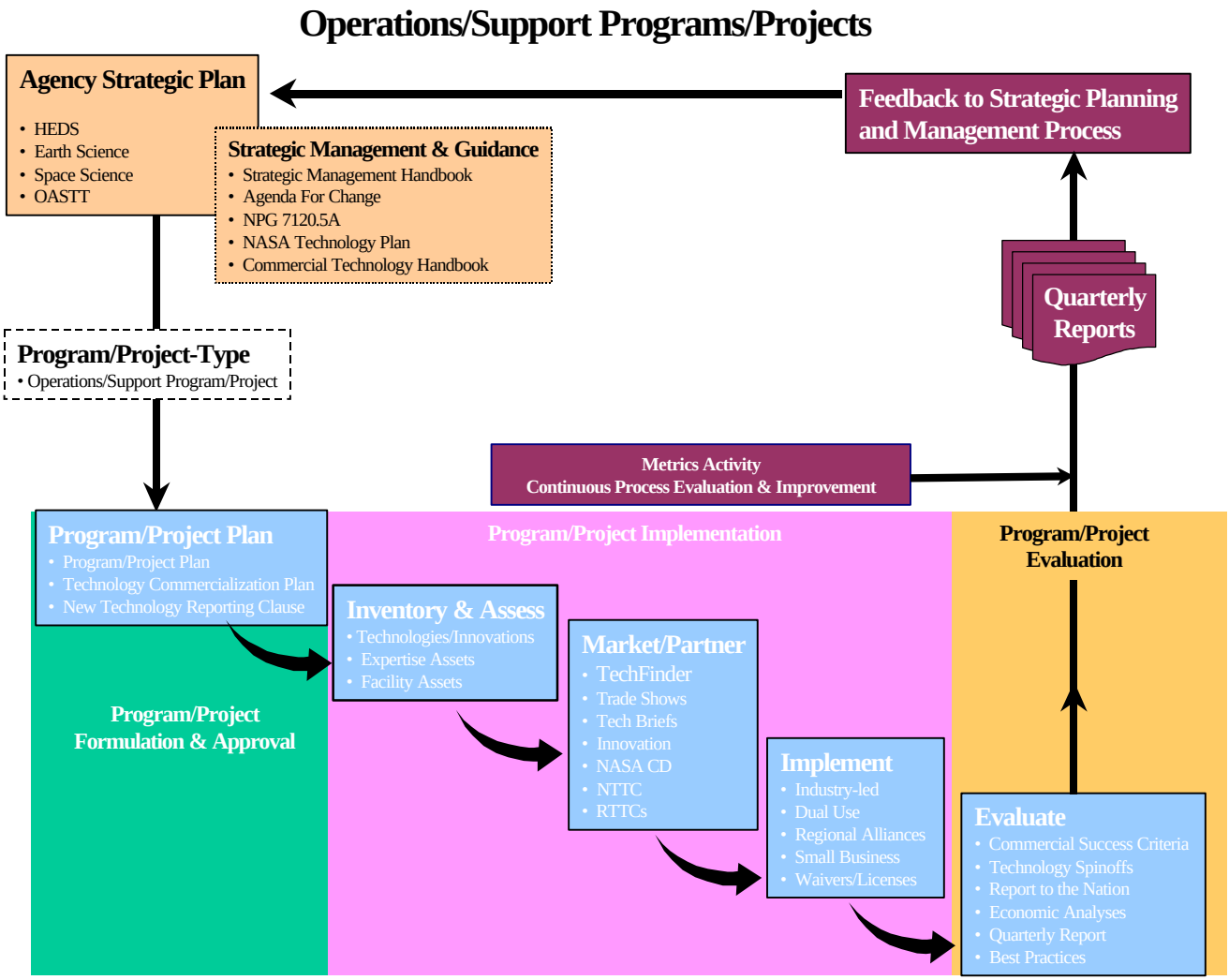
- Post-Development Technology Diffusion—the linking of existing NASA technologies with commercial applications and aggressive promotion and introduction of them into the marketplace. This technology diffusion can take the form of technology licensing or other forms of collaborations when licenses are not appropriate. However this mechanism should be used after all others have been ruled out.

Technology Supported Programs/Projects



Operations/Support Program Projects

These programs/projects do not generally include either 'technology focused' or 'technology supported" activities. Thus, it is not expected that the program/project emphasize technology commercialization in the overall program/project management process to the same degree as the other two programs. However, because of the often highly technical nature of operations/support programs, numerous innovations of value to the commercial marketplace often result. Thus, at the minimum, these programs should still develop a commercial technology plan, which emphasizes the prompt reporting, and processing of any innovations developed by the program/project. The most likely partnership mechanisms to be used for these programs are Commercial Technology Acquisition and Post-Development Technology Diffusion - both of which were discussed earlier. The figure below illustrates how the commercial technology process is likely to be implemented by this type program/project.



Formulating a Technology Commercial Strategy and Plan

The majority of NASA programs/projects will develop a commercialization strategy. The major output of this activity is a Technology Commercialization Plan. Again the specific focus and content of the plan will depend upon the program/project type.

When developing a commercialization plan and strategy, both technology focused and technology supported program/projects will address many of the same items. The primary difference is that the technology focused programs/projects are more proactive and are expected to have partnerships specifically defined prior to implementation. The following is a set of guidelines for NASA program/project managers to consider when developing their plan.

- Explore all innovative avenues to expand participation and infuse the latest technological and commercial Capabilities into the project.
- Explore how the assets (technology, discoveries, innovations, tools, processes, or software), developed as a byproduct of the program/project execution, can be infused into industry.
- Assess teaming and partnering options to achieve various aspects of the project.
- Ensure that the plans for technological or commercial cooperation include a full description of the opportunities for partnering, the potential partners, the need for protection of intellectual property, the likelihood of the partnership coming to fruition, the expected contribution (personnel, facilities, Independent Research and Development, or other funding), and the confidence that the partnership will remain in force through their commitment.
- Where possible, integrate NASA plans with the technology and commercialization plans of your customers. All potential cooperative technology and commercialization opportunities must be vigorously explored and, where advantageous to NASA, agreements enacted.
- Ensure that the planned technology exchange and partnership agreements comply with all laws and regulations regarding the transfer of sensitive and proprietary technologies.
- Rapidly identify and report promising technologies developed under the program/project that have dual-purpose application. The reports will be organized by technology type and shall contain (1) a statement of need pertaining to the situation that led to the development of the technology, (2) the approach being used or that was used in developing the technology, (3) a statement of technology benefits that will allow a potential user to evaluate the technology for the user's needs, (4) a list of potential users of the technology, (5) the status of the development effort, and (6) a point of contact who is familiar with the technology.
- Give strong consideration to the development of dual-use technologies which have application both within and outside the aerospace community.
- Identify, verify, and report to the Center's commercial technology office, success stories that have resulted from the assets or partnerships developed.
- Educate the contractor's work force in technology commercialization activities.
- Assist subcontractors with technology commercialization activities.
- Offer outreach activities aimed at marketing and commercializing technology.
- Collaborate with third parties for the purpose of effectively commercializing technology.

- Perform preliminary application engineering studies/prototyping for the purpose of adapting the developed technology to a specific commercial use.

- Establish an organizational structure for coordinating all technology commercialization activities that demonstrates a strong management commitment to technology commercialization.

- Provide support for NASA's outreach efforts pertaining to technology commercialization by assisting in the resolution of technical problems originating from industry.

- Recoup Government funds, which were provided to commercialize technology and to make the program financially self-sufficient.

- Track metrics designed to monitor the progress and quantify the success of the technology commercialization program.

- Report quarterly activities that pertain to the Technology Commercialization Plan, including metrics and the status of commercialization activity of the patent rights waived to the contractor by NASA.

Refer to Appendix B for an example of a Technology Commercialization Plan.

Reporting Innovations and Identifying Assets With Commercial Potential

One of the key activities in any technology commercialization strategy is identifying and reporting the specific "assets" that may have commercial potential. For purposes of the technology commercialization process; we categorize "assets" into three categories: new technologies and innovations; expertise; and facilities.

Crucial to the success of NASA's goal to share leading-edge technology with the U.S. industrial community is the New Technology Reporting Process.

This process has resulted in many inventions, discoveries, improvements, and innovations to the private sector for boosting competitiveness, creating jobs, and strengthening the economic base.

Reporting new technology and innovations is the responsibility of all NASA civil servants and contract employees.

Reporting New Technologies and Innovations (Including Software)

At this time the technology commercialization process is focusing on new technologies and innovations as the primary "commercializable asset". New technologies and innovations include "Reportable Items" and "Subject Inventions" developed by NASA contractors, grantees, and recipients of cooperative agreements, as well as inventions developed by NASA employees. The definitions of what constitute "Reportable Items" and "Subject Inventions" are contained in Federal Acquisition Regulations (FAR) and the NASA FAR Supplement (NFS). FAR clauses are provided in Appendix C, NFS clauses are provided in Appendix D. The clauses relevant to grants and cooperative agreements with institutions of higher education, hospitals, and non-profit organizations are provided at 14 CFR Part 1260 (grants), and 14 CFR Part 1274 (cooperative agreements). In general, new technologies and innovations include inventions, discoveries, processes, machines, manufactures, compositions of matter, or computer programs (software), whether or not they are or may be patented or protected by copyright, developed under NASA contracts, grants and cooperative agreements or developed by NASA employees. New Technologies and innovations can also be improvements to, or new applications of, existing inventions, discoveries, processes machines manufactures compositions of matter, or computer programs (software). To be patentable, an invention or discovery must be novel and useful, and must not be an obvious variation of a known technology. Generally, new technologies and innovations should be developed to the point that they have been shown to perform in their intended manner. It is ideal to have a working prototype, but it is not required.

NASA contractors, grantees, and recipients of cooperative agreements under most NASA funding agreements must report "Reportable Items" and "Subject Inventions". The FAR and NFS contain guidelines for administration of the patent rights and new technology clauses in those contracts. Each NASA Center is responsible for implementing the guidelines. Additionally, inventions developed by NASA employees must be reported to the Center's Office of Patent or Intellectual Property Counsel, or Office of Chief Counsel at Centers that do not have a Patent or Intellectual Property Counsel.

Many times the innovators or developers of a new technology are in the best position to recognize the potential for additional uses of the innovation. These uses may be beyond the innovation's originally intended purpose. It is important that innovators report both original and potential uses of their innovation to the NASA technology commercialization representatives in the Center's Commercial Technology Office. Even if no immediate additional external-NASA uses are known, a promising technology candidate can be publicized by the Center's Commercial Technology Office in a variety of ways. This exposure frequently gains the attention of someone who can connect the technology capability to a problem needing that particular solution. It is preferable to report items that may later be determined not to qualify than to fail to report a valid innovation. Remember: If in doubt, report it!

Appendix E shows the process flow diagram for identifying and reporting new technologies and innovations and contains a detailed explanation of the process. New technologies and innovations can be reported either electronically ***http://nasaentre.techtracs.org/*** or with a form. Appendix E illustrates the NASA Form 1679, Disclosure of Inventions and New Technology (Including Software). Reporting electronically requires a password which can be obtained from the applicable Center's Commercial Technology Office. NASA contractors may use their own company invention disclosure forms as long as the company form provides information equivalent to that requested in NASA Form 1679 (however,

NASA Form 1679 is the preferred document). NASA employees should submit NASA Form 1679 to their Center's Office of Patent or Intellectual Property Counsel. NASA contractor employees submit forms to the NASA New Technology Representative named in the contract, through the contractor's new technology representative.

It is important to recognize that with respect to many technologies, innovations may occur at the system, sub-system, or component level. That is the development of a "system" or overall "technology area" could yield numerous innovations. And there could be several "systems" and/or "technology development areas" within a program or project. Specificity is important for determining if there are commercial interests in the item.

Who Should Report New Technologies and Innovations (Including Software)?

- NASA large business contractors and for profit organizations awarded NASA contracts, grants or cooperative agreements are required to comply with reporting requirements identified in the New Technology or Patent Rights Clause in the Contract, or Patent Rights Clause in the Grant or Cooperative Agreement**.**
- NASA small business contractors are required to comply with the Patent Rights Clause of the Contract.
- Non-profit organization, colleges and universities awarded NASA Grants/Cooperative Agreements are required to comply with the Patent Rights Clause in the Grant/Cooperative Agreement.
- NASA Civil Service employees are required to report inventions as soon as possible after conception (NPD 2091.1)

Why Report New Technologies and Inventions (Including Software)

- Reporting New Technologies and Inventions as soon as possible after conception allows the Center's Patent Counsel to determine ownership and whether intellectual property protection is appropriate.
- Reporting prior to public disclosure, publication, or presentation at a conference allows Patent Counsel to file a patent application prior to possible statutory bars, which may preclude patent protection.
- Filing a patent application establishes and protects rights.
- Secrecy provides little protection for the innovation.
- Publication, while allowing recognition through peer review, may jeopardize the possibility of obtaining a patent on the innovation (see the section below on External Release Of Information Disclosing Innovations and New Technology (including Software).
- Identification for possible Technology Commercialization with benefits to the economy and NASA.
- Professional recognition.
- Consideration for awards.
- Publication in NASA Tech Briefs/NASA Patent Abstracts Bibliography once a patent application is filed or a decision is made not to file.

Who are the Innovators?

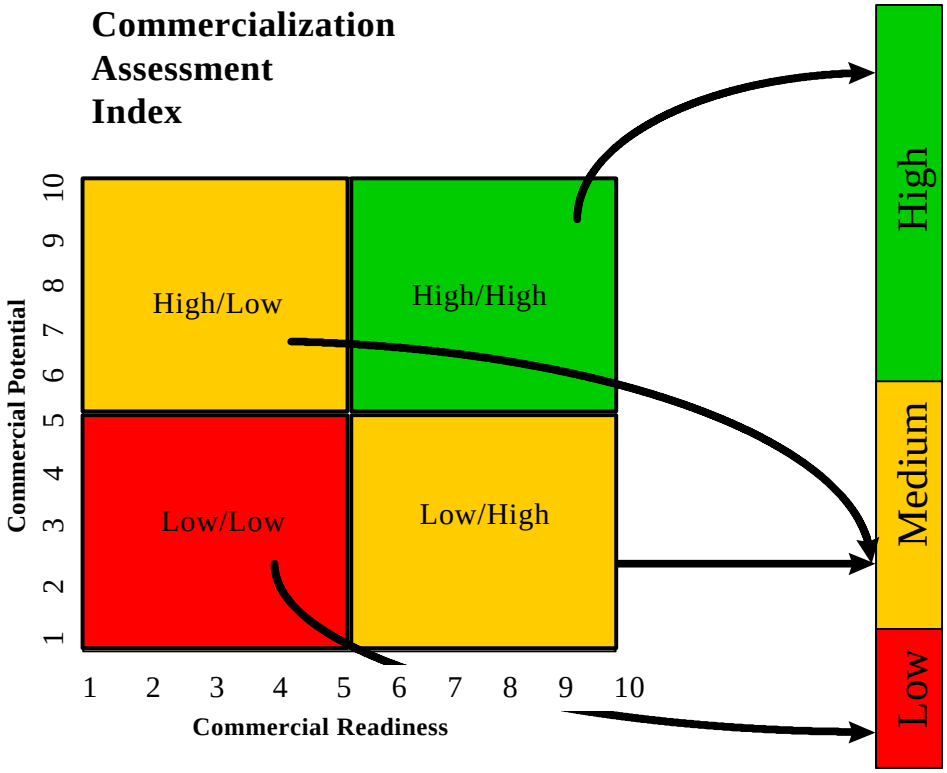
There is often a misunderstanding about who should be listed as innovators when reporting a new technology. In many successful developments, there is a tendency to identify as many participants as possible to share in any rewards. In reporting new technologies and innovations, the guideline to follow is to identify only those who have made direct, unique, and significant contributions to the conception of the innovation. Conception within the meaning of the patent law requires the formation, in the mind of the inventor, of a definite and permanent idea of the complete and operative invention, as it is thereafter to be applied in practice. The idea must be of specific means, not just a desirable end result, and must be sufficiently complete so as to enable anyone of ordinary skill in the art to which the invention applies to reduce the concept to practice. To be a joint inventor, one must in some way have beneficially affected the final conception of the claimed invention. The following guidelines can be used:

- Persons developing or contributing unique solutions to a requirement are included.
- Persons generating the requirement for an innovation are not normally included.
- Persons in the management "chain of command" who may have coordinated funding or scheduled activities, or someone performing routine fabrication, testing, or software programming at the direction of the individuals who conceived the innovative idea are not normally included.

When the filing of a patent application is being considered, properly identifying the inventors becomes very important. A patent can be declared invalid if either too many contributors (i.e., extraneous, non-contributors) or too few contributors (significant contributors omitted) are named on the patent application or patent.

Evaluating New Technologies and Innovations

Once reported, the new technology is processed by the Center's Commercial Technology Office to determine such things as patentability, licensability, intellectual property rights, publishability, etc. A key step in this processing is the determination of the "reportable item's" commercial potential. There are numerous methodologies for making such a determination. The figure below illustrates one such methodology. The overall likelihood of a successful commercialization (i.e. commercial potential) is determined on a scale of 1 (low) to 10 (high). The likely time frame (commercial readiness) for this happening is also estimated on a scale of 1 (relatively long-term i.e.5+ years) to 10 (short term, i.e. a year or less). As this approach illustrates an overall rating can be developed by combining these two factors.



Marketing and Finding Partners

Developing a marketing strategy and identifying potential partners for a NASA program/project's technologies and innovations is perhaps the most challenging part of the overall technology commercialization process. Each Center's Commercial Technology Office is available to support the NASA program/project in developing and implementing its commercialization/partnering strategy. This includes a range of activities to actively target and identify firms that have the capability to take a NASA technology from concept to the marketplace. Options available are:

- showcasing your technology to potential industry partners at trade shows;
- targeting companies by direct mail who are in an industry that can benefit from NASA technology;
- showcasing NASA technology at business seminars with high level corporate executives;
- targeting companies in different industries through magazines, public service announcements ;
- promoting technologies through press releases to the media;
- accessing electronic commerce/TechFinder;
- through the national gateway at the NTTC; and
- through a regional gateway through the RTTC in your region

Contact your Center's Commercial Technology Office to see which strategy is the best for your specific technology. That organization is staffed with marketing experts who can assess your technology and determine the optimum method for finding an industry partner. They are a resource to you and can perform any of the functions listed above.

The resolution of intellectual property rights is also a key factor in a NASA program/projects's commercialization and partnership development strategy. However, even if intellectual property rights remain with a contractor, grantee or recipient, continued NASA support could enhance commercialization success. For example, the NCTN is still available to support that contractor/grantee/recipient by maintaining on-line summaries of their technologies and innovations and publicizing articles in NASA Tech Briefs and in Aerospace Technology Innovation. Any partnership leads that are identified by the NASA Technology Centers would be forwarded to the contractor/grantee/recipient.

Other Marketing Options to Showcase NASA Technology and Innovations

NASA Tech Briefs

Based on results of a commercial evaluation of NASA developed or funded technologies, an article describing the technology or innovation may be published in "NASA Tech Briefs". This is a monthly magazine distributed free of charge to qualified subscribers, which publishes brief synopses (Tech Briefs) of NASA new technologies that have been identified as having potential commercial value. Innovators of technologies selected for publication as a Tech Brief will receive a $150 cash award.

NASA Tech Briefs is:

- An official publication of NASA
- A unique, powerful tool for engineers, managers, and scientists to reach industries they wish to target
- The largest engineering magazine in circulation in the U.S.

NASA Tech Briefs' is circulated to over 207,000 industry readers in the U.S. alone. The monthly magazine features exclusive reports of innovations developed by NASA and its industry partners/contractors that can be applied to develop new/improved products and solve engineering or manufacturing problems. The "Tech Briefs" span a wide array of fields, including electronics, physical sciences, materials, computer software, mechanics, machinery/automation, manufacturing/fabrication, mathematics/information sciences, and life sciences.
Most briefs offer a Technical Support Package (TSP) which explains the technology in greater detail and provides points of contact for questions or licensing discussions. NASA Tech Briefs also contains feature articles on successful NASA spinoffs, profiles of NASA tech transfer resources, and technology application stories. Regular news columns describe new patents, industry products, software, and literature.

Technical Support Package (TSP)

The Commercial Technology Office at the Center may determine that a Technical Support Package or TSP needs to be developed for the new technology or innovation. Most technologies selected for Tech Briefs have a TSP prepared for them. A TSP provides a full description of the item; a description of the problem the item addresses; any unique features of the item; and the potential market applications. Appendix g is an example of a TSP. The innovator and/or program manager/COTR may be asked to assist. Contact your commercial technology office for information about publishing in Tech Briefs.

Aerospace Technology Innovation (ATI) Magazine

ATI is a bi-monthly publication of the NASA Headquarters Commercial Technology Division. It is a source for information on NASA technology commercialization projects and technology opportunities in the areas of technology commercialization, aerospace technology development, small business innovation research, and provides information concerning commercial mission updates, announcements and upcoming events.

ATI's objective is to promote NASA's successes in technology commercialization activities resulting from collaborations with industry. Articles published are primarily success stories on partnerships between NASA and external entities which have resulted in the development of products and services (new and enhanced) derived from space technology.

Highlight sections of ATI include:

- *Technology Opportunity Showcase* publishes NASA technologies ready for commercialization in which NASA is seeking partners. This section advertises for industry partners to collaborate with NASA for license of NASA technology;

- *Aerospace Technology Development* publishes the latest advances in aeronautics and space research;

- *Small Business Innovation Research* publishes success stories resulting from NASA funded small business research projects;

- *Publications, Events, MultiMedia* lists upcoming events, conferences, award recipients, and the latest in tech transfer publications and updated information about our electronic mediums (CD-ROM, website, software, etc).

For more information about ATI, access the Commercial Technology website at URL: http://www.nctn.hq.nasa.gov.

Send subscription requests to URL: http://www.innovation.hq.nasa.gov

Technology Opportunity Sheet (TOP)

The Center's Commercial Technology Office may also decide to develop a TOP for the new technology or innovation. Technology Opportunity Sheets are similar to Tech Briefs, but are prepared to support directed marketing efforts. They usually contain a more detailed discussion of potential commercial applications of the technology than is normally included in a Tech Brief. Appendix H is an example of a TOP. The innovator and/or program manager/COTR may be asked to assist.

Electronic Commerce/TechFinder

TechFinder is a "single stop shop" where customers can search NASA's entire asset inventory for items that match their interest and not have to search numerous individual databases located at various NASA sites. TechFinder is a subset of NASATechTracS and is continuously updated by NASATechTracS**.** Our customers can now search a database with over 24,000+ technologies, 600+ success stories, and 4,000+ programs. Techfinder will also include a facility inventory and a personnel "expertise" inventory. Eventually, these data will be incorporated into NASATechTracS. Thus when completed, this asset inventory will include individual technologies, programs, success stories, facilities and expertise.

One of the key TechFinder features allows a user to automatically submit an E-mail requesting additional information on any individual technology, success story, or program area in which they are interested. Thus far TechFinder has supported over 70,000 search-related transactions—delivering over 340 million data bytes. Over 10,000 specific e-mail technology inquiries have been received and processed. Many of these requests represent potential partnerships and success stories for NASA. In addition, TechFinder automatically captures key information on the requester and keeps it in a client file in the database.

TechFinder can be accessed on the Internet at URL: http://technology.nasa.gov

NTTC Gateway

The National Technology Transfer Center (NTTC) is a one-stop shop for federal laboratory system information. The collection, organization, and dissemination of information on technology are a principal value added function performed by the NTTC. The NTTC database provides access to over $70 billion annually in research and development and 100,000 researchers at 700 federal laboratories and 100 universities.

Access to the Gateway can be made by telephone (1-800-678-6882). Customer service representatives work with callers to refine their questions. Often the customer service representative is able to provide a relevant reference or answer to the question with the caller still on the line.

For more complex queries, NTTC technology experts and information specialists develop customized strategies to search multiple technology databases. These databases include descriptions of technologies, expertise and capabilities collected from federal laboratories; licensable technologies from NASA other federal agencies and over 100 research universities; scientific and technical reports from a variety of federal agencies, including NASA; and information on over 19,000 SBIR solicitations and awards.

In addition to general services, the NTTC Technology gateway offers the following fee-based services:

- Direct Internet Searching
- Technology Expert Services
- Market Research Services

A service related to the Gateway in the NTTC web site URL: http://www.nttc.edu. Using this web site as a departure point, an individual is able to reach other sites in the NASA Commercial Technology Network (NCTN), as well as connect to a host of other valuable technology transfer related sites.

NASA Partnership Agreements

Partnerships are business arrangements among the government, industry, and/or academia wherein each party commits resources to the accomplishment of agreed-to objectives and shares the risks and rewards of the endeavor.

Partnering Options

The following outlines some of the options for partnering, including a brief description of the purposes and goals of the legal arrangements. Determinations regarding NASA's level of participation, funding and/or partner reimbursement are made based on the principal purpose of the agreement and relative interest of the parties.

NASA Space Act Agreements

Based on the authority of Section 203(c)(5) of the Space Act (42 U.S.C. 2473(c)(5)), NASA utilizes Space Act Agreements for entering into partnerships to transfer technology to the private sector. NASA has statutory authority to enter into CRADA's, but does not use this authority when NASA technology commercialization objectives can be met within the parameters of Space Act agreements.

Agreement Defined

"Agreement" defined in the broadest of contexts includes any agreement concluded under the authority of the NASA Space Act (contracts, leases, cooperative agreements, or other transactions). Generally, agreements establish a set of legally enforceable promises between NASA and another party to the agreement, requiring a commitment of NASA resources (including funding, services, equipment, expertise, information, or facilities) to accomplish the objectives of the agreement. Agreements are categorized according to the character of the other party to the agreement; e.g., an entity can have either a public (state) or private (corporate) nature. In addition NASA has traditionally categorized agreements into those providing for payment of NASA's costs by the other party (a reimbursable agreement), and those requiring NASA and the other party each to bear the cost of the undertaking (a nonreimbursable or cooperative agreement). In some cases, NASA may enter into agreements to provide funding to a party (a funded agreement). Another significant basis on which agreements are categorized is whether the agreement is enforceable under U.S. or international law.

When is an Agreement Required?

An agreement is required whenever there is a commitment of NASA resources involving an entity other than NASA. The NASA resources committed to the project may include time and effort of personnel and support services, use of facilities, use of equipment, and where appropriate, direct funding.

NASA Directives Related to Space Act Agreements

NASA Policy Directive (NPD) 1050.1F, "Authority to Enter into Space Act Agreements", provides delegation of authority for entering into Space Act Agreements. In NPD 1050.1F, Enterprise Associate Administrators, Officials-in-Charge of Headquarter Offices, the Director's of NASA Centers, and the Manager of the NASA Management Office-Jet Propulsion Laboratory (NMO-JPL), within their area of jurisdiction, are responsible for negotiating, amending, executing and terminating reimbursable and nonreimbursable Space Act Agreements except for International Space Act Agreements. Consistent with the NASA Strategic Plan, Enterprise Associate Administrators will establish, with the Centers carrying out their program, guidelines for exercising this authority. The Space Act Agreements Manual denoted as NASA Procedures and Guidelines document NPG 1050.1F, explains the philosophy, delineates approaches and describes policies, authorities and procedures involved in creating Space Act Agreements with outside entities.

Reimbursable Space Act Agreement

A public or private party wishing to advance its own research and development (R&D) efforts may enter into an agreement to reimburse NASA for the use of its facilities, personnel, expertise or equipment on a non-interference basis consistent with NASA's mission. Essentially, NASA is paid for providing a good and/or service. However, in doing so, NASA may not compete with the private sector. Therefore, reimbursement may be accepted only for those goods or services that are developed

in-house and are unique to NASA and NASA may only provide the good or service if an equivalent is not generally available on the commercial market. While the terms, conditions and schedule are negotiable, NASA must be paid in advance for each stage of the effort.

Two types of reimbursable agreements exist -- those that are fully reimbursable and others covering partially reimbursable activities. A fully reimbursable agreement permits a public or private entity to use NASA facilities, personnel, expertise or equipment to advance its interests. Unless a statute or agency waiver allows for less than full cost reimbursement, NASA is reimbursed for all accountable costs as defined in FMM9090. With a fully reimbursable agreement, NASA has no requirement for the results of the activities performed and, but for the requirement of the reimbursing party, NASA would not be undertaking the activity. Therefore, all the costs must be borne by the reimbursing party. This includes risk costs. Even when NASA could meet a request for reimbursable services, two threshold considerations must still be met. The first is that the proposed activity must conform to NASA's performance of its functions. So, for example, NASA could enter into an agreement with a commercial company to permit its use of a unique NASA test facility to test a commercial product. On the other hand, NASA would not be in a position to allow use of its buildings as dance halls, even if an ideal location was identified and the party wished to reimburse NASA for all associated costs. U.S. taxpayers, through our congressional authorization and appropriations committees do not fund NASA facilities to provide dance halls.

The second factor has to do with protecting private sector entities from Federal Government competition. The current National Space Policy directs U.S. Government agencies to purchase commercially available space goods and services to the fullest extent feasible and to conduct their activities in a manner that does not preclude or deter commercial space activities except for reasons of national security or public safety. Therefore, reimbursement is accepted only for those facilities and services that are developed in-house, are unique to NASA, or generally are not available on the commercial market from another source. NASA should not act as a purchasing agent or broker for partner acquisition of available goods, parts, or services if they are commercially available. Thus, as a general matter, where NASA is requested to provide a service that it obtains for itself through a contract with a private sector firm, it should decline to provide that service under a reimbursable Space Act agreement. A limited exception to this general standard may occur when NASA has contracted for a service such as training, and another agency or entity wants to participate in that training activity on a reimbursable basis. Another example of unacceptable competition with the private sector would occur if NASA were requested to review a company's engineering plans for soundness and technical feasibility. If other experts in the private sector can perform such an analysis, NASA should decline to provide the service.

Sometimes a reimbursable agreement may be only partially reimbursable. This is appropriate where mutual interests are served on a collaborative basis. Such collaborations enable both NASA and the other party to undertake research which would not have occurred had the parties been required to fully fund their own activity (nonreimbursable agreement) or had the nonfederal entity been required to fully fund the entire agreement (fully reimbursable agreement). Partially reimbursable agreements require full cost recovery of the NASA activities designated to be reimbursed by the other party.

Nonreimbursable Space Act Agreement

A nonreimbursable Space Act Agreement permits NASA to offer its facilities, personnel, expertise or equipment as part of a collaborative arrangement. It is appropriate to use a nonreimbursable agreement where NASA and its agreement partner(s) are performing activities in cooperation, for which each is particularly suited, and for which the intended results are of interest to both parties. In order to use a nonreimbursable agreement, the NASA program manager or signing official must determine that the other party's contribution provides an adequate quid pro quo compared to NASA's contribution, recognizing that facilitating the transfer of technology is part of NASA's core mission. The benefit to the Agency from participating in the arrangement must be adequate as compared to its investment, the risks it assumes, and the parallel risks and potential benefits accruing to the other party.

Memorandum of Understanding (MOU)/Memorandum of Agreement (MOA)

Types of domestic nonreimbursable agreements include a Memorandum of Understanding (MOU) or Memorandum of Agreement (MOA) (the titles can be used interchangeably). An MOU or MOA with a domestic entity may document policy, practice or intention by a particular component of NASA affecting a matter of concern to both NASA and the entity. An example is a statement establishing intent to work together in the future. An MOU/MOA between NASA and a domestic entity is not intended to create legally enforceable rights, remedies or responsibilities in any party.
Nonreimbursable agreements with international partners are generally executed as letter agreements or MOU's enforceable under international law. An international MOU is appropriate when engaging in a joint activity that is determined to be

significant, thus requiring interagency review through the "Circular 175" process (coordinated through the State Department). NASA also makes fairly extensive use of letter agreements for international cooperative activities that are not deemed to be sufficiently "significant" to warrant State Department involvement in their conclusion. Such agreements involve exchange of letters setting forth and confirming the terms of an agreement. Upon the exchange of letters by both parties, such agreements constitute nonreimbursable agreements binding under international law. Normally, NASA does not transfer technology to foreign entities (NPD 2110.1D).

Funded Agreement

In certain limited cases, NASA may use a Space Act Agreement to transfer appropriated funds to another entity. As a matter of policy and practice, however, this is seldom done. It is only appropriate to use this type of arrangement when the stated purposes cannot be achieved through any of the other agreement instruments -- a contract, cooperative agreement, grant, reimbursable or nonreimbursable Space Act Agreement. Prior to using a funded Space Act Agreement, the signing official must determine that another type of funding instrument cannot meet the requirements of the agreement. A specific type of funded Space Act Agreement has evolved in the area of development and commercialization of NASA dual-use technologies. It is called the Joint Sponsored Research Agreement (JSRA). As with other types of Space Act Agreements, the principal purpose of the JSRA, or any other funded Space Act Agreement, is to advance NASA mission-related projects and goals.

Joint Sponsored Research Agreement

A Joint Sponsored Research Agreement (JSRA) is a collaborative R&D effort to conduct joint sponsored research with individual companies and consortia. A JSRA is appropriate when its use will advance NASA's mission-related projects or goals such as leveraging the cost of technology developed between NASA and the private sector, enhancing U.S. industry's competitive position in the global marketplace, or converting aerospace technology to commercial application. Under a JSRA, NASA may provide resources including funds, services, equipment, information, intellectual property, personnel or facilities, on a shared or pooled basis for the purpose of developing and commercializing dual-use technology. Cash or an in-kind contribution by the industry partner is required and must be in reasonable proportion to funds committed by NASA. Equal cost sharing is the goal.

Cooperative Agreement Terminology

In addition to reimbursable, nonreimbursable and funded Space Act Agreements, sometimes a potential agreement partner will request a cooperative agreement. Confusion over the term "cooperative agreement" frequently arises because at least three major pieces of legislation, affecting the Federal Government, use the term in three different contexts. Under the authority of the Space Act, NASA can enter into a cooperative agreement as further defined in the Chiles Act [31 U.S.C. 6301 et seq.]. NASA's authority to enter into Chiles Act cooperative agreements is explicitly stated in the Space Act and is not derived from NASA's "other transaction" authority.

Frequently at NASA, the term cooperative agreement is used to describe a collaboration in which each party pays for its own participation in the joint effort. Domestically, this is more appropriately referred to as a nonreimbursable agreement. In the international context, the term "cooperative agreement" is used more frequently than nonreimbursable agreement. Sometimes cooperative agreement (MOU or letter agreement) is used to describe any collaboration with a foreign entity regardless of whether the agreement might include some form of incidental funding as part of the arrangement. Thus it can be difficult to ascertain what is intended when a request is made to enter into a "cooperative agreement."

In addition, the Stevenson-Wydler Act [15 U.S.C. 3701 et seq.] and Executive Order 12591, delegating parts of the authority granted under the Stevenson-Wydler Act, use the term "cooperative research and development agreement" (CRADA). This authority allows other Federal agencies engaged in research and development activities to enter into agreements very similar to the NASA domestic reimbursable and nonreimbursable Space Act Agreements. NASA, as a matter of policy and practice, has not used Stevenson-Wydler Act authority where NASA's technology commercialization objectives can be met through the Space Act.

Cooperative Agreements and Grants

A Cooperative Agreement, as authorized by the Space Act and defined by the "Chiles Act" (31 U.S.C. 6301 et seq.), is an assistance instrument the purpose of which is to transfer a thing of value from the Federal Government to a State, a local government or private entity to carry out a public purpose of support or stimulation. Substantial involvement between NASA and the other party is required. A cooperative agreement may be used to stimulate and support innovative new technologies and products for commercialization via technology research, development and/or deployment. An example is a NASA-industry cooperative agreement to jointly fund, research and develop a high-risk technology for potential dual-use applications. Such an agreement is appropriate where the project would not be possible without NASA funding as well as extensive NASA and recipient collaboration. Cost sharing or in-kind contributions by the industry partner are required, with a general target of at least 50-percent participation. Cost sharing, payment schedules and other financial arrangements are open to negotiation. Independent R&D funds are permitted as part of the cost-sharing arrangement. A cooperative agreement may not be used by NASA to satisfy specific mission requirements. Instead, it is intended to help the recipient carry out a public purpose within NASA's mission.

Since the purpose of a cooperative agreement is research and development, it is quite possible that inventions will be made or valuable data will be produced. Moreover, since cooperative agreements are intended to stimulate commercial activity, these agreements routinely leave patent ownership, through election or waiver, with the industry partner while the Government retains a government purpose license to use any patents, royalty free, for Governmental purposes. However, the Government keeps "march-in" rights to ensure that the technology is commercialized if the owner decides not to pursue it. The 1993 National Performance Review of the Vice President singled out NASA's expanded use of cooperative agreements (to include use with for-profit companies), as an example of the type of creativity needed to move our Government into the 21st century. The X-33 program is being conducted under a cooperative agreement between NASA and the Lockheed-Martin Corporation.

Grants, as further defined in the Chiles Act [31 U.S.C. 6301 et seq.], can also be awarded under the Space Act. A grant is an assistance instrument. NASA can award a grant when no substantial involvement in the activity is required of NASA and the principal purpose is to accomplish a public purpose of support or stimulation authorized by Federal statute.

Grants and cooperative agreements are governed by policies established by the NASA Office of Procurement. NASA regulations for entering into cooperative agreements with commercial firms can be found in 14 CFR Part 1274. NASA regulations for entering into cooperative agreements and grants with institutions of higher education and other nonprofit organizations can be found in 14 CRF Part 1260. In addition NASA NPG 5800.1D, dated July 23, 1996 prescribes policies and procedures relating to the award and administration of NASA grants and cooperative agreements with educational institutions, other nonprofit organizations, state and local governments and commercial firms.

Cooperative Research & Development Agreement (CRADA)

Federal Laboratories are permitted and encouraged to enter into Cooperative Research and Development Agreements (CRADA's) under the Stevenson-Wydler Technology Innovation Act, 15 U.S.C. 3701 et seq. The Act defines "Federal Laboratory" broadly to include a facility or group of facilities owned, leased, or otherwise used by a Federal agency, a substantial purpose of which is the performance of research, development, or engineering by employees of the Federal Government. It permits Government-operated Federal laboratories to enter into CRADA's, as distinct from contracts, cooperative agreements, and grants, for the purpose of transferring to the private sector Federally developed or controlled technology. Under a CRADA, the Federal laboratory can provide personnel, services, facilities, equipment, or other resources with or without reimbursement (but not funds to non-Federal parties). The non-Federal parties provide funds, personnel, services, facilities, equipment, or other resources toward the conduct of specified research or development efforts that are consistent with the missions of the laboratory (Public Law 99-502).

NASA has statutory authority to enter into CRADA's, but does not use this authority when NASA technology commercialization objectives can be met within the parameters of Space Act Agreements.

For informational purposes, the major distinctions between a CRADA and a Space Act Agreement follow:

CRADA	SPACE ACT AGREEMENT
--Federal Party must be a "lab."	--Any NASA component may be a party.
--Partnership must perform "specified research."	--No limitation on partnership purpose except within NASA's mission.
--Federal party prohibited from making cash contributions.	--Cash contributions permitted.
--Preference for domestic manufacturing.	--No statutory preference.
--Gov't personnel may be hired with funds received from a CRADA partner to perform work under the CRADA and will not count against FTE limits.	--No similar authority.
--Proprietary information that "results from research and development activities conducted under this Act" may be withheld for up to 5 years.	--Proprietary information that "results from activities conducted under a [Space Act] agreement" may be maintained in confidence for up to 5 years.
--Proprietary information provided to the Government must be withheld under FOIA (Exemption 3).	--Proprietary information provided to the Government may be withheld under FOIA (Exemption 4).
--Government may grant or agree to grant in advance to collaborating party, patent licenses or assignment, or options thereto, in any invention made in whole or in part by a lab employee under the agreement.	--NASA inventions created under the Space Act Agreement may be exclusively licensed only after publication in accordance with the requirements of 37 CFR Part 404.7.

Patent Waivers

NASA policy with respect to any invention, discovery, improvement, or innovation made in the performance of work under any NASA contract or subcontract with a large businesses and the allocation of related property rights is based upon Section 305 of the Space Act (42 U.S.C. 2457). Generally, under any NASA contract with a large business (i.e., those contracts subject to Section 305(a) of the Space Act), title to subject inventions vests in NASA. However, the Administrator may grant a waiver of title in accordance with 14 CFR Section 1245. For NASA contracts with large businesses, it is the policy of NASA to waive the rights of the United States to acquire title in and to any subject invention (with the reservation of a Government license and march-in rights) if the Administrator determines that the interests of the United States will be served. In determining when the interests of the United States would be served by waiver of all or any part of the rights of the United States in inventions, among the most important goals are to provide incentives to foster inventiveness and encourage the reporting of inventions made under NASA contracts, to provide for the widest practicable and appropriate dissemination of new technology resulting from NASA programs, and to promote early utilization, expeditious development, and continued availability of the new technology for commercial purposes and the public benefit.

Licensing

NASA may license patents, patent applications, and copyrights, to which it owns title, on a non-exclusive, partially exclusive, or exclusive basis. All licensing must comply with applicable statutes and regulations governing the licensing of Government owned inventions. Royalties obtained from the licensing of patents and patent applications are shared with inventors who have assigned their rights to NASA with the balance being retained at the Center from which the invention originated. There is no

statutory authority for agencies to retain, or share with authors, royalties obtained from the licensing of copyright. Thus, such royalties are submitted to the Treasury. Licensing and the distribution of royalties are covered in detail later in this handbook.

Small Business Innovation Research (SBIR)

This program involves the award of contracts to small businesses to seek innovative R&D that have commercial application potential. The SBIR program is designed to stimulate U.S. technological innovation, use small businesses to meet federal R&D needs, encourage participation by socially and economically disadvantaged persons in technological innovation and increase private sector commercialization of innovations derived from federal R&D.

The program has three funding and development phase options. Phase I is a six-month study to establish the feasibility and technical merit of a proposed innovation. Funding does not exceed $70,000. Phase II is the major R&D effort usually lasting 24 months. Greater emphasis of commercial potential for non government uses is required, and contracts do not exceed $600,000. Phase III completes the development of a product to make it commercially available. Financial resources must be obtained outside the funding for SBIR. Federal agencies may fund Phase III for follow-on work of an innovation for its own use.

Small Business Technology Transfer (STTR)

This program involves the award of contracts to small businesses for cooperative R&D with a research institution (nonprofit research organization) to transfer technology developed by universities into the private marketplace through the entrepreneurship of a small business.

The program has three funding and development phase options. Phase I projects receive up to $100,000 in funds for a one-year feasibility and technical merit study of a proposed innovation. Phase II is a two year major R&D effort, with greater emphasis on the commercial potential of the technology. Funds do not exceed $500,000. Phase III completes the development of a product to make it commercially available. Financial resources must be obtained outside the funding for STTR. Federal agencies are encouraged to utilize products developed under Phase III for application to their projects.

Appendix I provides more information on the SBIR and STTR programs.

NASA Partnership Agreements Summary		
Type of Agreement	**Primary Use**	**Other Features**
Reimbursable Space Act Agreement	Agreement with public/private entity to use NASA facilities, personnel, expertise or equipment to advance its own R&D efforts.	NASA is reimbursed or paid in advance for each stage of the effort. NASA may not compete with the private sector.
Nonreimbursable Space Act Agreement	A collaborative effort of mutual benefit in which NASA and the entity contribute facilities, personnel, expertise or equipment. No transfer of funds.	Supports industry needs and shares results in a collaborative effort.
Memorandum of Understanding (MOU)/ Memorandum of Agreement (MOA)	Domestically, sometimes used to document a statement of policy, practice, intention or accomplishment affecting NASA and a domestic partner. Internationally, an MOU engages NASA and an international partner in a significant activity.	International MOUs are enforceable under international law. However, normally NASA does not transfer technology to foreign entities.
Cooperative Agreement	Jointly funded research effort with a public purpose, such as, to stimulate and support development of innovative new technologies and products for dual-use applications or commercialization.	Substantial involvement between NASA and the recipient is required. Cost sharing or in-kind contributions required by the partner. Governed by the NASA Office of Procurement.
Grant	An assistance instrument to accomplish a public purpose of support or stimulation authorized by Federal stature (e.g., scientific research at universities and non-profit organizations), where no substantial involvement between NASA and the recipient is required.	Governed by the NASA Office of Procurement.
Joint Sponsored Research Agreement (JSRA)	Jointly funded R&D collaboration with individual companies or consortia to advance NASA's mission-related projects, to enhance U.S. industry's global competitiveness, or to commercialize aerospace technology. NASA may provide funds, services, facilities, equipment, information, intellectual property, or personnel.	Cash or in-kind contribution by the industry partner is required and must be reasonable in proportion to NASA's commitment. (see the Program Information Package (PIP) available at NASA Commercial Technology Offices).
Cooperative Research and Development Agreement (CRADA).	Agreement between a Federal Laboratory and the private sector to transfer federally funded technology to the private sector. Federal lab can provide personnel, services, facilities, equipment or other resources with or without reimbursement.	Federal Lab may accept, retain and use funds, personnel, services and property from a CRADA partner and provide personnel, services and property to a CRADA partner. Government may grant in advance to a CRADA partner, patent licenses or assignments in inventions made by a lab employee under the CRADA.

Identifying and Validating Success Stories

The purpose of this step is to identify and characterize which partnerships have yielded success stories. Success Stories are defined as those commercial applications which have "acknowledged use" of a NASA related asset. Usually this acknowledged use should also include at least one of the following:

- revenue generation;
- cost savings/avoidance;
- private investment;
- jobs created/saved; or
- quality of life improvement.

Success story data is captured in NASATechTracS. Success stories can be reported electronically via URL: http://webawntts.larc.nasa.gov/success_stories/NASASuccessStory.html. Each NASA program/manager may review the status of any success story related to their activity via their NASATechTracS tool.

Once a success story has been publicly released—it can be accessed via NASATechTracS Tech Finder. Appendix J contains several examples of success stories. To see a more complete set of NASA success stories go to URL: http://technology.nasa.gov.

The success story data in NASATechTracS can be modified to fit a targeted publication and/or audience. These articles can be used as marketing tools, to further the technology commercialization process, by gaining more publicity for NASA efforts.

External Release Of Information Disclosing Innovations and New Technology (Including Software)

The publication or public disclosure of information disclosing an invention by any party before the filing of a patent application may create a bar to a valid patent. Accordingly, the Center Patent Counsel must be consulted and must provide prior approval of any external release of information disclosing new technologies and innovations in which the Federal Government owns or may own a right, title, or interest. Furthermore, external release of software must comply with NPD 2210 "External Release of NASA Software" and its accompanying guidance document NPG 2210.

Statutes and regulations (35 U.S.C. 205 and 37 CFR Part 401) provide Federal agencies the authority to withhold from disclosure to the public information disclosing any invention in which the Federal Government owns or may own a right, title, or interest for a reasonable time in order for a patent application to be filed. Furthermore, Federal agencies shall not be required to release copies of any document which is part of an application for patent filed with the United States Patent and Trademark Office or with any foreign patent office. The Presidential Memorandum on Government Patent Policy dated February 18, 1983, specifies that agencies should protect the confidentiality of invention disclosures and patent applications required in performance or in consequence of awards to the extent permitted by 35 U.S.C. 205 or other applicable laws.

Moreover, in accordance with the policy set forth in Federal Acquisition Regulation (FAR) Sections 27.302(j) and 27.305-5, to protect their mutual interests, contractors and the Government should cooperate in deferring the publication or release of invention disclosures until the filing of the first patent application, and use their best efforts to achieve prompt filing when publication or release may be imminent. Thus, the Government will, on its part and to the extent authorized by 35 U.S.C. 205, withhold from disclosure to the public any invention disclosures reported under the contract clauses of FAR Section 52.227-11 or NASA FAR Supplement (NFS) Section 1852.227-70 for a reasonable time in order for patent applications to be filed.

As an additional protection for small business firms and nonprofit organizations, regulations prescribe that for a period of 18 months from the filing date of a patent application, agencies shall not disclose or release to third parties, pursuant to request under the Freedom of Information Act or otherwise, copies of any document which the agency obtained under contract and which is part of a domestic or foreign patent application filed by the contractor on a subject invention to which the contractor has elected to retain title. This prohibition does not extend to disclosure to other Government agencies or contractors of Government agencies under an obligation to maintain such information in confidence.

For inventions made by employees of NASA contractors and recipients of NASA grants and cooperative agreements (hereinafter referred to collectively as contractors), the contract specifies time periods during which the contractor may obtain title to inventions. During these time periods, the contractor must satisfy certain contractual requirements in order to obtain title. The contractual requirements and the time periods during which those requirements must be satisfied depend upon the type of contractor involved. In general, there are two broad categories of contractors: small entity contractors and large entity contractors. Small entity contractors include small business firms, colleges, universities, and non-profit organizations. All other contractors (i.e., large businesses) are considered large entities.

As a general rule, if a small entity contractor elects to retain title to an invention or if a large entity contractor obtains title to an invention through a waiver, NASA should not publicly release information disclosing the invention unless permission is obtained from the contractor. The Center's Office of Patent Counsel should always be consulted prior to releasing any information disclosing a contractor owned invention or innovation.

The Government owns inventions made by its employees as a result of their employment. The Government may also own, or obtain title to, inventions made under NASA contracts. Title reverts to the Government by action of law and/or terms of the contract if the contractor fails to, or chooses not to, obtain title in accordance with the contract. Once the Federal Government owns or holds title to an invention, it is the policy of the NASA Office of General Counsel to withhold such information from public release until a decision has been made by the Center Patent Counsel whether or not a public release is appropriate, and in no case prior to the decision whether or not to file a patent application has been made.

Licensing and Distribution of Royalties

Patent Licensing

NASA actively engages in the process of protecting NASA owned inventions by obtaining patents on inventions resulting from federally funded research or development. NASA files patent applications only on inventions to which it owns a right, title or interest through an assignment. NASA owns inventions made by its employees as a result of their employment. NASA may also own, or obtain ownership of, inventions made under NASA contracts, grants and cooperative agreements. NASA may license patent applications and patents to private industry in compliance with statutes (35 U.S.C. Chapter 18) and regulations (37 CFR Part 404) on the licensing of Government owned inventions. The negotiation of patent licenses commences at the respective NASA Center where the invention occurred. All NASA licenses are negotiated individually with the prospective licensee.

The NASA General Counsel is responsible for the disposition of NASA intellectual property, including the licensing of NASA owned technologies. The General Counsel executes all licenses on behalf of NASA. Furthermore, all licenses are to be based on the NASA model exclusive and nonexclusive license agreements provided by the Office of the General Counsel at NASA Headquarters. These model licenses were drafted to forestall legal problems encountered in the past. Thus, any substantive deviations from the model license agreements should be discussed with and concurred in by the Office of General Counsel at NASA Headquarters before placement into a license agreement. However, the licensing process should be a collaborative effort between the Center Office of Patent Counsel and the Center Commercial Technology Office, with the Center Patent Counsel and the Director of the Center Commercial Technology Office working together to negotiate all licenses. Licenses may be granted on an exclusive, partially exclusive, or non-exclusive basis. Exclusive or partially exclusive domestic licenses may be granted on federally owned inventions only after notice of the invention's availability has been announced in the Federal Register and only if notice of a prospective license, identifying the invention and the prospective licensee, has been published in the Federal Register, providing opportunity for filing written objections. Nonexclusive licenses may be granted under federally owned inventions without publication of availability or notice of a prospective license.

The procedures for licensing Government inventions have been codified in 37 CFR Part 404. A license may be granted only if the applicant has supplied the Federal agency with a satisfactory plan for development or marketing of the invention, or both, and with information about the applicant's capability to fulfill the plan. This “commercialization” plan should ideally contain information relative to the time, nature and amount of anticipated investment of capital and other resources the prospective licensee believes will be necessary in order to bring the invention to practical application; the field or fields of use for which the prospective licensee intends to practice the invention; information as to the prospective licensee’s manufacturing, marketing, financial, and technical resources; and where the prospective licensee intends to manufacture any products which may flow out of the invention and the geographic area where the prospective licensee intends to use or sell the invention.

A license granting rights to use or sell a federally owned invention in the United States shall normally be granted only to a licensee who agrees that any products embodying the invention or produced through the use of the invention will be manufactured substantially in the United States. Licenses shall contain such terms and conditions as the Federal agency determines are appropriate for the protection of the interests of the Federal Government and the public, including the following required terms and conditions:

- The duration of the license shall be for a period specified in the license agreement.
- The license may be granted for all or less than all fields of use of the invention or in specified geographical areas, or both.
- The license may extend to subsidiaries of the licensee or other parties if provided for in the license but shall be nonassignable without approval of the Federal agency, except to the successor of that part of the licensee's business to which the invention pertains.
- The license may provide the licensee the right to grant sublicenses under the license, subject to the approval of the Federal agency. Each sublicense shall make reference to the license, including the rights retained by the Government, and a copy of such sublicense shall be furnished to the Federal agency.
- The license shall require the licensee to carry out the plan for development or marketing of the invention, or both, to bring the invention to practical application within a period specified in the license, and to continue to make the benefits of the invention reasonably accessible to the public.

- The license shall require the licensee to report periodically on the utilization or efforts at obtaining utilization that are being made by the licensee, with particular reference to the plan submitted.
- The license shall provide for the right of the Federal agency to terminate the license, in whole or in part, under conditions specified by law.
- Licenses may be royalty-free or for royalties or other consideration.

Royalties may consist of a nonrefundable license fee to be paid by the licensee upon execution of the license; a running royalty which can be expressed as a percent of net sales of the royalty base products or which can be expressed in terms of a fixed amount per year; and a minimum royalty which will be due only if the running royalty is not met in a given year.

All licenses must be reviewed and approved by the Office of General Counsel at NASA Headquarters and executed on behalf of NASA by the NASA General Counsel. Once a NASA Center, in coordination with its Patent Counsel, and the prospective licensee have agreed to a licensing agreement, the agreement is forwarded to the Office of the Associate General Counsel (Intellectual Property), NASA Headquarters, for final review and execution.

Assistance in obtaining information on patents available for licensing should be directed to the Commercial Technology Office at the NASA Center where the invention occurred. Other sources of information on the availability of NASA

Patents may be obtained by searching the following:

- NASA Tech Briefs
- NASA Regional Technology Transfer Centers
- National Technology Transfer Center
- Patent and technical literature searches

Software Licensing

NASA recognizes that software that is developed either by NASA, or for NASA, under a Government contract, is a valuable piece of intellectual property. In general, the underlying functional aspects of software (e.g., a process implemented by the software or a machine or apparatus containing or directed by the software) may be protected by patent while the specific software code that implements the functional aspects may be protected by copyright. NASA can obtain domestic and foreign patents on the underlying functional aspects of the software if it satisfies the requirements for patentable subject matter. On the other hand, copyright protection is not available in the United States for a work of the United States Government. A particular software code created solely by an officer or employee of the United States government as part of that person's official duties is a work of the United States Government. However, the Government can claim foreign copyrights for software created by its employees. Although the Government may obtain a patent on the "process" which led to the development of software, potential licensees may prefer to commercialize software based on the exclusivity provided by a copyright on the software.

Software that has been developed by a contractor under a NASA contract may be protected by copyright. NASA can direct its contractors to assert their copyright and assign it to NASA when software is created under a NASA contract and the company has no plan to commercialize the software (NFS clause 1852.227-14). Once the Government obtains the copyright, NASA may enter into a license agreement with a prospective licensee. However, contractors may retain the copyright in the software if they provide the Contracting Officer a written request for permission to assert the copyright, including an acceptable plan to commercialize the software, and the Contracting Officer, in consultation with the Center Patent Counsel, provides the contractor written permission granting the request. Software that is a joint inseparable work of NASA employees and NASA contractor employees are protected under copyright and, absent an agreement to the contrary, are co-owned by NASA and the contractor, with each having an independent right to use or license the use of the work. However, before licensing a joint work, NASA should consolidate ownership by obtaining an assignment of the contractor's copyright pursuant to the contract clause.

Patented software related invention and copyrighted software code that are owned by NASA may be licensed as described in the previous section on Patent Licensing. The options which are available to NASA for transferring software developed solely by a federal employee, although not formalized, are varied. Each NASA Center has developed its own procedures for transferring software to industry. Mechanisms that may be used are Use Agreements and Space Act Agreements. The dissemination or transfer of software to private industry is an important NASA goal. Any transfer or release of NASA

software to entities outside of NASA must comply with NASA Policy Directive (NPD) 2210, External Release of NASA Software, and its accompanying guidance document NPG 2210.

Those parties who are interested in obtaining a transfer or license of software developed by or for NASA should contact the Commercial Technology Office at the respective NASA Center for information relative to their particular requirements.

Royalty Distributions

As stated earlier, royalties obtained from the licensing of patents and patent applications are shared with inventors who have assigned their rights to the United States Government with the balance being retained at the Center from which the invention originated. However, there is no statutory authority for agencies to retain, or share with authors, royalties obtained from the licensing of copyright. Thus, such royalties are submitted to the Treasury. Royalties from NASA patent licenses are distributed to the inventor(s) and to the appropriate NASA Center as detailed below.

The distribution schedule to the inventor(s) is as follows:

- For one inventor, the inventor shall receive the first $5,000.00, plus 25 percent of the remainder of the royalties received
- For 2-4 inventors, each inventor shall receive an equal share up to $5,000.00 each plus 25 percent of the remainder up to the first $25,000.00 received; plus an equal share of 30 percent of the remainder after the first $25,000.00 received by NASA
- For five or more inventors, each inventor shall receive an equal share of the first $25,000.00 received plus an equal share of 30 percent of the remainder after the first $25,000.00 received by NASA. After the distributions have been made to the inventor(s), the balance of the royalty money is distributed to the appropriate NASA Center and can be used in the following manner:
- Payment of expenses incidental to the administration and licensing of intellectual property (including patent application preparation, prosecution, maintenance fees, travel and other costs related to inventions originating at the Center)
- Scientific research and development consistent with the research and development missions and objectives of NASA and the particular NASA Center
- Education and training of employees consistent with the research and development missions and objectives of NASA or the particular NASA Center and for activities that seek to increase the potential for technology commercialization of the various NASA Centers
- To further scientific exchange among the NASA Centers

Of particular interest is that royalty money can be distributed back to the NASA Center where the invention originated and be used for further research and development consistent with the missions and objectives of that NASA Center. In having royalty money distributed to the Center where the invention originated, NASA will be able to use those funds to continue research in the technology which gave rise to the invention or to use the funds in new research areas but which are consistent with the Agency’s and Center’s mission.

Benefits and Awards to NASA Innovators

Each NASA Center has an Award Liaison Office which will provide information to NASA innovators concerning benefits and awards for their innovations. Also, refer to the NASA Invention & Contribution Board's web site. URL: *http://www.hq.nasa.gov/office/codei/alos.html.*

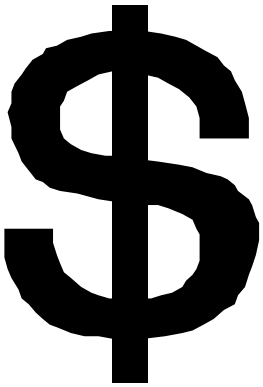
Patents offer many benefits to the inventors and to NASA. Those benefits include:

- Provides a symbol of prestige and professional stature.
- Provides monetary awards.
- Enhances Technology and Commercialization.
- Patent protection provides the exclusivity required for licensing the technology to industry.
- Royalties obtained from licensing patents and patent applications are shared with the inventors.

The Space Act Awards Program is designed to:

- Reward individuals (both NASA and Contractor employees) for scientific and technical achievements
- Stimulate the identification and documentation of innovations
- Enhance technology commercialization
- Publicize innovations that broaden the boundaries of technology
- Provide peer recognition
- Increase exposure for new ideas that should be developed
- Improve productivity and efficiency
- Strengthen Centers of Excellence in government laboratories

Innovators are eligible for one or more monetary Space Act award:



- Upon filing of a patent application

  $500 to a sole inventor; or
  $250 to each of two or more inventors

- Upon acceptance of software by your Center's Software Releasing Agent or authority:

  $500 to a sole inventor/author; or
  $250 to each of two or more inventors/authors

- When published in *NASA Tech Briefs:*

  $150 to each innovator

Government innovators are eligible to share in royalties as described in the section on Licensing and Distribution of Royalties.

Innovators are eligible for NASA Inventor of the Year Award or Software of the Year Award

Recipients of the above awards are honored with:

- Award check and certificate
- Ceremony

Innovators are eligible for *additional* Space Act awards:

You can obtain supplemental awards for new technology innovations based upon the significance of future benefits or savings to NASA. Supplemental awards can be made ***UP to $100,000*.**

NASA Employees and Contractors Shared in the Numerous Space Act Awards (ranging from $2,000 to $45,000 per team).

Over the last five years NASA employees have shared awards of approximately $800,000 per year for the development of various technologies.

Approximately 2,500 NASA Employees and Contractors have received Space Act Award checks each year: 40% received by NASA Employees and 60% by Contractors.

Refer to your Center's Space Act Awards Administrator for application procedures and additional information. Examples of Space Act Awards from all NASA Centers are archived at URL: *http://www.hq.nasa.gov/office/codei/90sbest.html.*

Training and Education

All NASA employees have a responsibility to support agency mission goals, including the commercialization of technology which results from internal or funded research and development activities. In the Agenda for Change, the Administrator recognized NASA's responsibility to "...provide necessary commercial technology training to employees to enable them to fulfill new job requirements and to enable the agency to achieve its (technology commercialization) goals".

Recognizing that agency employees will require a variety of courses and instructional approaches to meet this requirement the agency, in cooperation with the National Technology Transfer Center (NTTC), has undertaken the following actions:

- Sponsored the development and quarterly delivery of a two-day course on Technology Commercialization for NASA Personnel. This course is offered under the sponsorship of the NASA Headquarter's Program Project Management Initiative (PPMI) supported by the Office of Human Resources & Education (Code FT).
- Sponsored the development of two courses: Technology Assessment and Basics of Licensing Technologies. An Advanced Licensing course is under development.
- Sponsored the development and delivery of a one-hour briefing on technology commercialization geared to project management personnel. This briefing is included in the PPMI Project Manager's Course.
- Sponsored the development of specialized, on-demand training on topics such as NASATechTracS.
- Sponsored the design and administration of a Center-based training needs assessment.
- Sponsored the development of alternative information and training resources including:

NASA Solutions CD ROMs that provide information on NASA technologies available for commercialization, as well as the NASA technology commercialization process.

NASA Commercial Technology Network (NCTN) and National Technology Transfer Center (NTTC) web sites which provide a variety of information on NASA technology commercialization activities, and links to other relevant sites. The URLs for the sites are: **NCTN**: http://www. nctn.hq.nasa.gov; NTTC: http:// www.nttc.edu.

NCTN Introductory Videos featuring the six Regional Technology Transfer Centers and the NTTC. Videos are available on Legal Issues in technology commercialization and on the NASA SBIR and STTR Programs.

A Web-Based Technology Commercialization Resource Guide, containing technology commercialization information pertaining to NASA and other federal laboratories URL: http://www.nttc.edu/training/guide)

Web-Based Information Resources on a variety of topics.

Three Video Case Studies which illustrate successful NASA technology commercialization undertakings.

A CD-ROM Based Orientation and Introduction to NASA Technology Commercialization.

In addition to work performed in cooperation with NASA, the National Technology Transfer Center also offers a number of other courses on technology commercialization topics, including:

- Foundations of Technology Transfer
- Commercializing Technologies
- Laboratory Outreach
- Technology Marketing
- Intellectual Property Negotiation
- On Line Technology Resources
- Valuation
- Fundamentals of Industrial Extension
- Industrial Extension

In addition to NASA PPMI and NTTC offerings, specialized training and education experiences also are available from organizations such as the Licensing Executives Society (LES), Association of University Technology Managers (AUTM), and the Federal Laboratory Consortium (FLC).

Export Control Program

U.S. Export Control Laws and Regulations

NASA and the U.S. Export Control

The technology commercialization activities sponsored by the NASA Commercial Technology Program are intended to foster domestic utilization of NASA-developed technologies among the public and private sectors of the U.S. economy. NASA generally does not provide NASA technology information material to foreign entities (see NPD 2110.1). In conducting it's technology commercialization activities, NASA must be aware of and comply with U.S. export control laws and regulations as documented in the NASA Export Control Program (ECP). Export controls are imposed on transfers of commodities, software, or technologies to foreign parties, regardless of whether they occur in the United States, or overseas, or in space. Export control laws and regulations are meant to protect our national security and further U.S. foreign policy objectives. NASA is on the leading edge of technological development in space, aeronautics, and a variety of scientific endeavors, and must be aware of and adhere to U.S. export laws and regulations.

Definition of "Export"

- Any shipment, transfer, or transmission of commodities, technology, or software out of the United States;
- Any transfer to any person--either within or outside of the United States--of commodities, technology, or software, by physical, electronic, oral, or visual means, with the knowledge or intent that the items will be shipped, transferred, or transmitted outside of the United States;
- Disclosure of technical data to a foreign national, by physical, electronic, oral, or visual means, within or outside of the United States (disclosures to U.S. nationals representing foreign interests are not exports unless there is knowledge or reason to know that the technical data will be further disclosed to a foreign party);
- Any transfer to a foreign embassy or affiliate; and
- Transfer of control over a satellite or instruments on-orbit.

NASA Export Control Program

The NASA Export Control Program (ECP) is a NASA-wide (Headquarters and Field Centers) system established to ensure that exports and transfers to foreign parties (within or outside the U.S.) are consistent with the Export Administration Regulations (EAR) and the International Traffic in Arms Regulations (ITAR) and NASA policy.

NASA export officials are available for consultation, and are involved in the external release of NASA software (NPD 2210.1), the release of scientific and technical information (NPD/NPG 2220.5E), the approval of foreign visitors to NASA installations, and intentional transfers of commodities, technical data and software to foreign parties. More information on the NASA Export Control Program including a listing of NASA Export Control Officials can be found on the Internet at: URL: http://www.hq.nasa.gov/office/codei/nasaecp/

Export Control and Headquarters Program/Project Managers

All NASA Headquarters Program/Project Managers shall include "export control milestones" in their Program/Project plans to ensure that export control matters are considered and resolved in advance of prospective shipping or transfer dates. In addition, all NASA Headquarters Program/Project Managers shall, in consultation with the Headquarters Export Administrator (HEA), ensure that international activities under their direction include:

- Appropriate safeguards for commodities, technologies, and software exported or transferred pursuant to international agreements;

- Provisions of necessary technical information to the HEA to permit a sound determination as to the need for validated export licenses or other documentation in specific activities, and for the completion of such documentation, where necessary; and

- Adequate lead time for the submission, processing, and receipt of validated export licenses, where necessary.

General Export Control Responsibilities for NASA Personnel

While it is the responsibility of every NASA employee to observe U.S. export control laws and regulations, the HEA, Center Export Administrator's (CEA), Export Counsel, Program/Project Managers, and Transportation Officers are the key personnel charged with ensuring NASA's compliance with those laws. Any questions regarding export control matters or procedures applicable to NASA programs should be directed to the HEA or CEA's, as appropriate.

No exports or transfers of commodities, technologies, or software should be made to any foreign entity under any NASA program until the HEA, CEA's, or Program/Project Managers concerned, as appropriate, are confident that such exports or transfers are in conformity with U.S. export control restrictions.

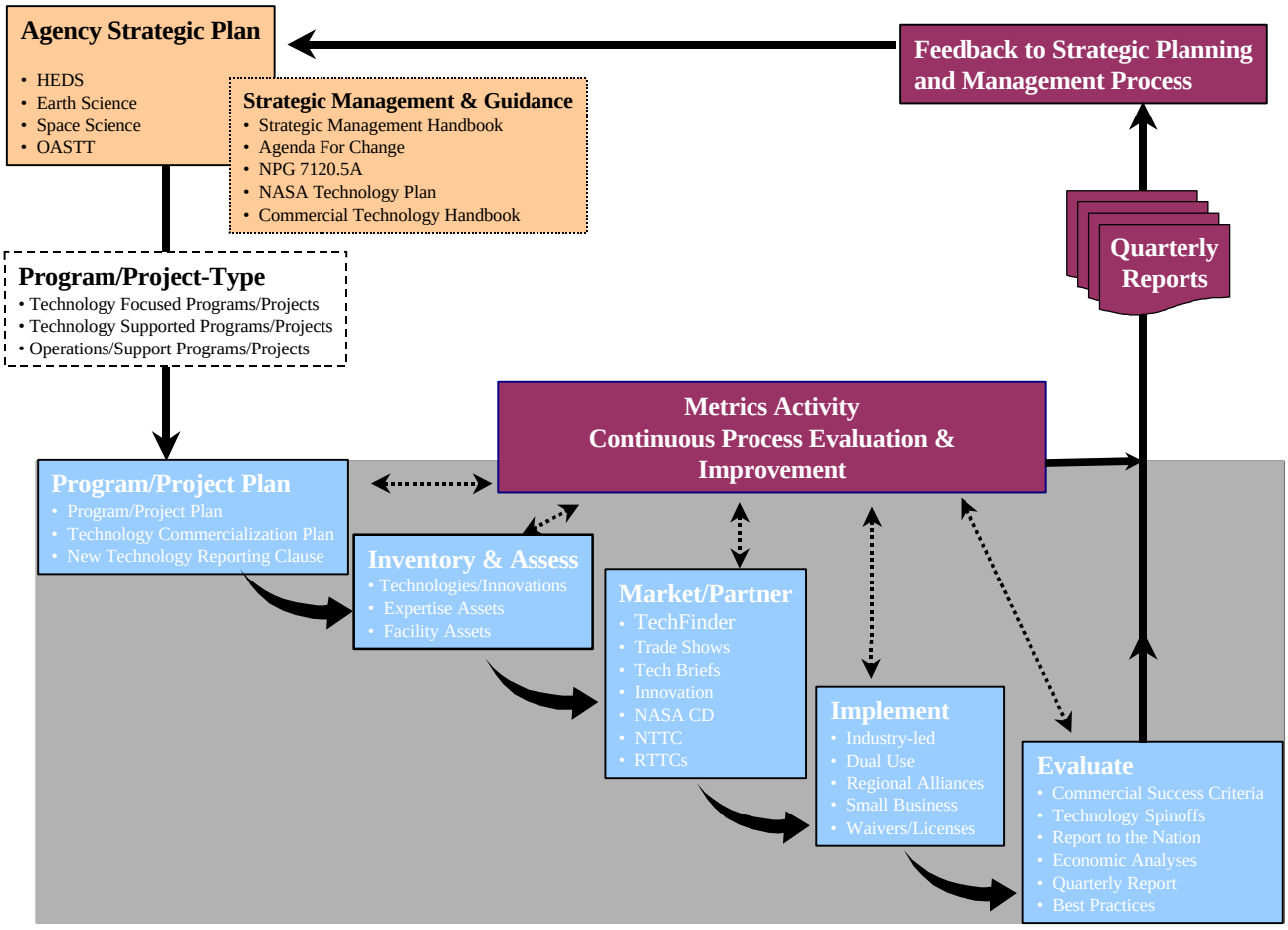
The full NASA Export Control Program document with important relevant links is available on the Internet at: URL: http://www.hq.nasa.gov/office/codei/nasaecp/.

Evaluating Results-Metrics

Background/Overview

Metrics are a key functional area defined by the Agenda for Change. As such they are a critical component of NASA's Commercial Technology Program. They provide management a key tool for continuing to improve the quality and performance of the overall Commercial Technology process. Metrics have been or are currently being defined for each of the steps in the figure below.

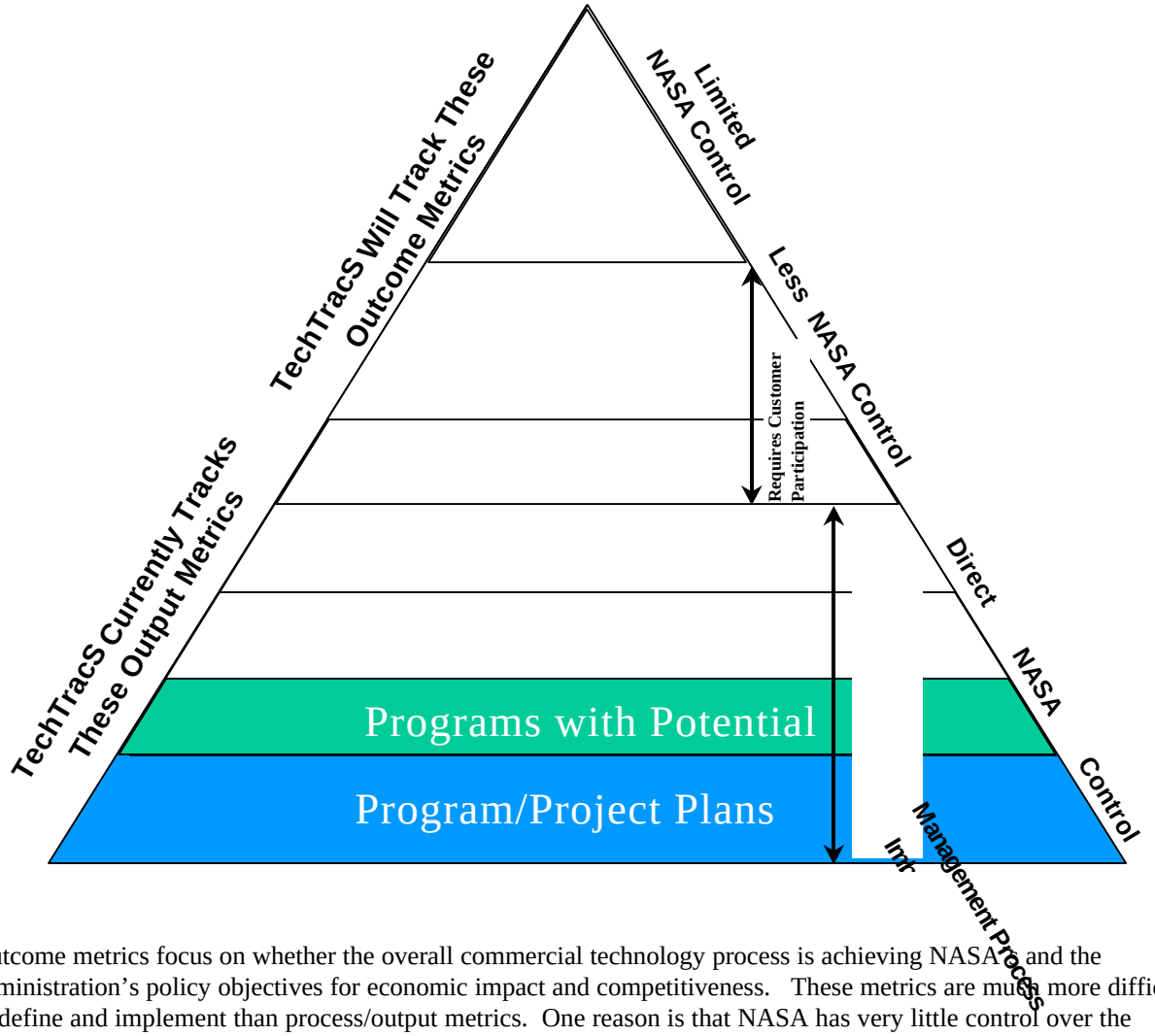
Simplified NASA Commercial Technology Process



The metrics activity includes both process/output metrics; as well as outcome metrics. The Commercial Technology Metrics Hierarchy as shown on the next page, illustrates how the metrics relate to each other in a hiearchial fashion.

Process/output metrics focus on the direct outputs from each of the process areas shown above; how efficiently and effectively the process is producing these outputs.; and the overall quality of these outputs. Most of these output products are "data/knowledge driven". New technology reports, TechBriefs, and success stories are good examples.

Commercial Technology Metrics Heirarchy



Outcome metrics focus on whether the overall commercial technology process is achieving NASA and the administration's policy objectives for economic impact and competitiveness. These metrics are much more difficult to define and implement than process/output metrics. One reason is that NASA has very little control over the market forces that determine the long-term impacts resulting from a successful commercialization of a NASA derived technology. However we are currently developing a model that will attempt to "measure" the economic impacts from our commercial technology mission. This model will build upon the process/output model discussed above.

Initial metrics reporting to the NASA Deputy Administrator began in April 1994 with annual reports for FY95-98. Per the Deputy Administrator's direction, quarterly reporting will begin with the first quarter in FY99. Appendix K is the format for the above report. The following sections in this document are referenced to Appendix K.

NASA Activity Baseline (NAB)(Appendix K: Columns B-I)

All metrics are developed based on a NASA Activity Baseline (NAB), which is tied to NASA's FY cycle. The NAB defines those NASA programs and activities which are subject to the Commercial Technology Mission as directed in NASA's strategic plan and Agenda for Change. The purpose of establishing such a baseline is to demonstrate that NASA is complying with the National Performance Review (NPR); the Government Performance and Results Act (GPRA) and NASA's Agenda For Change. This compliance requires that NASA assess and inventory the commercial potential of all its activities. Currently the NAB is defined as those activities, which have been active for any portion of a FY i.e. there has been obligations and/or costing activity. This set of activities is maintained current via a monthly update from NASA's financial and accounting system (FACS). Generally NASA invests approximately $12B in its baseline activities.

The NAB is further categorized by how many activities have a "reportable item" clause and then by what activities are believed to have commercial potential. Contracting Officers are responsible for applying the "reportable item" clause to the activities. Approximately 80% of the NAB has some form of "reportable item" clause. If a center's commercial technology office disagrees with certain activities having the clause they can set the "Reporting Obligation" data field to false for that item. This will allow an assessment of whether the Contracting Officer is applying the "reportable item" clause inappropriately on a large scale.

Centers are only responsible for assessing those activities, which have some form of the "reportable item" clause. All activities not having a "reportable item" clause will automatically be assessed as having no commercial potential. This approach keeps us in compliance with the NPR that we assess all our activities but reduces the burden on the centers. Contracting Officers are responsible for applying the "reportable item" clause to the activities. Approximately 80% of the NAB has some form of "reportable item" clause. If a center's commercial technology office disagrees with certain activities having the clause they can set the "Reporting Obligation" data field to false for that item. This will allow an assessment of whether the Contracting Officer is applying the "reportable item" clause inappropriately on a large scale.

In addition, there are other activities that are not tracked by the FACS such as MOUs and unfunded Space Acts. However, depending upon their commercial applicability these activities should be included as part of the baseline. Each center's Commercial Technology Office is responsible for identifying and maintaining an accurate status on these activities. Obviously NASA's in-house activities should be part of the NAB. The guidelines for incorporating these activities are currently contingent upon NASA's implementation of its full cost accounting process.

The following items address the specific metrics for the NAB area and are keyed to Enclosure 2:

- **Intra-mural $$ (Column B):** TBD—Estimates of each centers' in-house expenditures is currently shown.

- **Extra-Mural $$ (Column C):** This is the total $$ obligated to a center or enterprise's activities (contracts, grants, & agreements) during the fiscal year. NASA's procurement and financial data system provides a monthly update electronically at the 7-digit UPN level.

- **Total Activities (Column D):** This is the total # of extra-mural activities that were financially active during the FY (i.e. there has been obligations and/or costing). NASA's procurement and financial data system provides a monthly update electronically. Space Act activities which aren't captured by the financial and procurement system are added by the Commercial Technology Office at each field center.

- **Programs/Projects with Commercialization Plan (No column--This is a planned metric):** The Administrator recently approved the NASA Technology Plan (http://actuva-www.larc.nasa.gov/techplan/). This plan addresses NASA's agency-wide technology activities. It requires that these activities develop a technology transfer and commercialization plan up-front in the program. This metric will initially address the % of those NASA new technology activities, which require a technology commercialization plan from inception. This metric will be produced for both Field Centers and Enterprises.

- **Activities with Clause (Column E):** This is that subset of Column D that contains one of the "reportable item" clauses as required by NASA's Space Act. The activity's contracting officer makes the decision as to whether the clause should be included in the activity. These clauses vary by type of activity but all are based on what's referred to as a "reportable item".

- **% Reporting (Column F):** All activities with a clause are required to make annual interim reports and a final closeout report. This is a summary report that declares whether any "reportable items" have been submitted. This metric shows the % of activities that have provided an interim/final report if required. It is calculated by dividing the # of activities that have provided the interim/final report by the # of activities that "owe" an interim/final report. This metric will be developed for both centers and enterprises.

- **% With Potential (Column G):** Field Centers are only responsible for assessing those activities, which have some form of the "reportable item" clause. All activities not having a "reportable item" clause will automatically be assessed as having no commercial potential. This approach keeps us in compliance with the NPR that we assess all our activities but reduces the burden on the centers.

Only those activities that have been identified as having potential will be used in analyzing new technology reporting performance. Thus if a CTO believes that the contracting officer has inappropriately applied the "reportable item" clause to an activity; then all the CTO has to do is mark that activity as having no commercial potential. Thus these activities will not be included when analyzing new technology reporting performance.

Each center will assess their activities at the 7-digit UPN level. The 7-digit area is determined to have commercial potential if there is a reasonable likelihood that it will produce a technology, innovation, facility and/or expertise that will have commercial applicability and benefit. This metric is developed for each Center as well as each Enterprise. Currently this metric is determined by dividing the sum of the current year obligations for those activities assessed as having commercial potential by the sum of the total current year obligations for that Center's or Enterprise's applicable baseline. The Commercial Assess data field and the CY Obs data field in the Inventory table are the primary data fields used to calculate this metric. The COTR's assessment is made at the 7 digit UPN level and is thus weighted by $$. Columns H & I show the % of activities, which the COTR has assessed as having no potential at this time or has not yet assessed.

Reportable Items (Appendix K: Columns J-R)

These metrics address the reporting of new technologies and innovations from the NAB. Columns J thru L address the NAB's extra-mural programs and activities while Columns M & N address the in-house activities.

- **% With Reportable Items (Column J):** This is the subset of Column G that has actually reported at least one new technology or innovation to date.
- **FY98 Extra-Mural Items (Column K):** This is the total number of items that have been reported by the Column J activities during the fiscal year.
- **Cumulative Extra-Mural (Column L):** This is the total number of items that have been reported by the Column J activities to date.
- **FY98 Intra-Mural Items (Column M):** This is the total number of items that have been reported by the in-house activities.
- **Intra-Mural Items for the Last 5 Years (Column N):** This is the total cumulative # of items that the in-house activities have reported for the last 5 years.
- **Total FY98 Items (Column O):** This is the total of both Extra-mural & Intra-Mural items for the FY (Columns K + M).
- **Total Active Items (Column P):** This is the total number of items (Extra-Mural & intra-Mural) that has been reported to date from the NAB (Columns L + N).
- **% Available to the Public (Column Q):** This is the subset of Column P that is available to the public via the Web. Currently this metric is not reported to the Deputy Administrator. However—it will be calculated by both Enterprise and Center and will be available to the NCTMT. This metric responds directly to our linkage to the "Communicate Knowledge" strategic process.
- **% With TSP/TechBrief (Column R):** This is the subset of Column Q for which there is a TSP &/or TechBrief available. As currently planned this metric will be available to he NCTMT but will not be provided in the quarterly report to the Deputy Administrator.

The above metrics will be produced for each strategic enterprise and center. The NTR Date Received; the Case #; the Report As; and the UPN are the data fields in NASATechTracS used to calculate this metric. In order to report this metric by each NASA Enterprise; each "reportable item" will require at least one UPN assigned to it. Until UPNs are consistently applied extra-mural reportable items will be assigned to the Enterprise which has provided at least 50% of that extra-mural's obligations to date. Intra-mural "reportable items" will be assigned to that centers' institutional code. For example, all of LARC/LERC/DFRC/ARC intra-mural items will be assigned to the Office of Aero-Space Technology. The patent counsel will be using the Report As data field in doing its analysis of reportable items.

Partnerships (Appendix K: Columns S&T)

Currently there are two partnership metrics:

- the # of partnerships (columns S); and
- partnership investment as a % of R&D dollars (Column T).

These metrics were defined and approved by the NCTMT as part of the original Agenda for Change. More specifically the metrics team defined a set of partnership criteria which was approved by the NCTMT and included in subsequent direction from the NASA Deputy Administrator. Under this approach "partnership criteria" are provided and each center is responsible for assessing its activities against these criteria. The metrics team concluded that it was not plausible for it to identify the definitive set of a center's activities that qualify as a partnership. Rather it was up to each center to assess its own activities and identify which qualified as partnerships using the following criteria:

- The partnership is documented in some form, which at a minimum must substantiate the relationship between the partner and NASA.
- One party to the partnership is NASA, JPL or a NASA contractor/grantee acting under a NASA contract, grant or agreement.
- At least one intent or purpose of the agreement is commercialization of NASA technology or the acquisition of commercial technology for pursuit by NASA (but not merely the purchase of goods or services).
- The agreement must anticipate the transfer of technical know-how from the staff of one entity to that of the other.

The NCTMT did decide that given the above criteria; the following categories of activities automatically qualified as partnerships:

Cooperative Agreements: This includes all formal cooperative agreements included in the procurement process as well as others such as Joint Sponsored Research Agreements provided that they anticipate technology transfer and commercialization. The entire $$ investment in these activities are counted.

Space Act Agreements: This includes those funded, reimbursable, and no-exchange-of-funds Space Act Agreements provided that they anticipate technology transfer and commercialization. . The entire $$ investment in these activities are counted.

SBIRs/Phase II: Because of the strong commercialization language in these programs; the NCTMT believed that these activities and the entire $$ invested in them qualified as partnerships.

Contracts & Grants: The partnership status of contracts and grants (which make up the bulk of the NAB) is not as straightforward as the above activities. Over 80% of NASA's resources go toward these activities. However while deciding whether a contract or grant qualifies, as a partnership is subjective—the partnerships criteria discussed above does provide some minimum guidelines. Two general provisions must be met. First, the contract or grant must include an item of work whose purpose is to either transfer technology from NASA to the contractor/grantee for commercialization purposes or from the contractor/grantee to NASA(Spin-in). Second, the contractor/grantee has in place agreements or written plans for commercialization by means of product investment, intra-company transfer or transfer to a business partner. Given these guidelines there are two primary ways that a contract or grant can qualify for as a partnership activity:

- **Strong commercialization emphasis** is contained in the contract or grant. The SBIRs/Phase II are a good model of this type partnership. If a contract/grant has similar commercialization language and emphasis—than it most likely qualifies as a partnership(and most likely the majority of the $$ invested count).

- **Waivers/Patents** have occurred on the contract/grant. Waivers would apply to those contracts with large entities. Patents would apply to the non-profits; colleges and universities; and small businesses. In filing for a waiver a large entity addresses a potential desire to commercialize. In granting the waiver, NASA has acted "as a partner" in granting the commercialization rights to a technology it has "paid for." Thus the signed

waiver is a technology partnership. This partnership mechanism was thoroughly discussed and agreed upon by an inter-agency working group on technology transfer metrics chaired by Commerce and OMB. The working group also allowed that the agency's investment in that technology would be a fair estimate of the partnership value. In the case of non-profits; colleges/universities; and small businesses—the technology rights initially belong to them. Thus a patent action on a technology would be needed to signal commercialization intent and thus qualify for a partnership. Again the agency's investment in that technology would be a fair estimate of the partnership value.

Licensing is a key partnership mechanism with respect to in-house activities. Again the agency's investment in that technology would be a fair estimate of the partnership value. The situation of licensing the same technology to multiple applications does qualify as multiple partnerships. However counting the agency's technology investment multiple times has raised concerns about the credibility of this criteria in this specific situation. This situation was also discussed in the inter-agency working group—even to the degree of having several economists examine the issue. Based on quite common economic assumptions—a case can be made for counting the agency's investment multiple times in that it helped each of the partners involved in the different applications to avoid these technology development costs. Essentially without the agency's technology each of these potential partners could have spent resources to develop this technology. Thus the agency's investment has enabled an "opportunity cost" avoidance. On the other hand there are clearly situations where using this criteria to place a value on NASA's partnership value for a specific license would not pass a "reasonableness test." The inter-agency metric working group left it up to each agency to decide how to value partnership activities that were tied to agency licenses. Our current approach is that the NCTMT will evaluate the "reasonableness" of valuing these type partnerships on a case-by-case basis.

The R&D base to be used for the Partnership % metric (Column T) can be calculated in at least three ways:

- R&D as submitted with NASA's budget each year to OMB and Congress. This includes all intra-mural and extra-mural R&D. For the past several years this has averaged approximately $9B;
- R&D as identified by the procurement system. This approach utilizes a government-wide system for categorizing procurements as R&D; support services; operations; etc. Using this approach NASA R&D averages between $5 to 6B per year: and
- The R&D base used to calculate the SBIR program funding.

Currently the second approach above (the procurement approach) is being used to calculate our partnership metric. JPL's current contract is not categorized as a R&D activity. To develop an estimate of JPL's R&D base we will count all of those areas on their contract which are funded by the Science, Aeronautics and Technology appropriation. As centers begin to identify licensing as partnerships, they will most likely begin to count (justifiably so) the in-house resources that were used to develop that technology. As this occurs we will begin to include in-house resources as part of the R&D base as opposed to just procurements.

Partnerships Assisted by NTTC/RTTCs (No Column—Metric Under Consideration)

The # of partnerships assisted by one or more members of the NCTN (e.g. RTTCs; NTTC; etc.) is information that consistently requested by NASA's strategic planning & GPRA staff.

Partner Contributions (No Column)

While not a NPR or GPRA metric, OMB requests every year an estimate of the resources that our partners have invested in the NASA partnerships. Our database contains data elements for these estimates—however they are not mandatory and very few of our partnerships have such data. Accordingly, our submittals to OMB are subjective estimates.

Success Stories (Appendix K: U&V)

The # of success stories per year made available to the public via the NASA TechFinder Web site (Column U) will be the metric that is reported to the Deputy Administrator. The total # of success stories for the year (Column V) will be provided to the NCTMT. In order to qualify as a success story with respect to either metric it must be

specifically related to one or more specific NASA-derived technologies and meet at least one of the following criteria:

- Resulted in revenue generation;
- Saved or created a job;
- Generated private capital investment; or
- Improved quality of life

In addition to being a metric, the success story data is heavily used by top-level NASA management. Thus the completeness and quality of our success story data is extremely important. NASATechTracS is the single agency-wide repository for success stories. In order to release the success story to the public the following data fields are mandatory:

- Title
- Date identified
- Company Name & Location
- Field Center
- Commercial Application Description
- NASA Application Description
- Social/Economic Impact Description(there is some discussion of making this data item optional)
- Related Technology Case #(Can Be More Than One)—If this can not be identified than either UPN, COG or Program Office data must be provided.
- Related Partnerships—By definition all success stories originate with a partnership
- NASA POC
- Keywords

If applicable the following data items should be also provided:

- Spin-Off References If Applicable
- Innovation Magazine References If Applicable
- Assist Data (If Applicable) For Our Network Agents (NTTC, RTTC; Etc)

Recent analysis of our success story data indicates that improvement is needed. As of 12/98 there were 1,586 success stories in the agency-wide NASATechTracS database. 853 (or 54%) of these have been authorized for release to the public by the centers. Only 192 of the 853 (approximately 23%) contain the essential data described above. For example, currently very few of our success stories have the specific technology or technologies identified to which it is related. Consequently we can not tie the success story back to the program investment (i.e.UPN) from which it came and thus to one of the strategic enterprises.

In order to assure data completeness for those success stories which are to be released to the public and made available to our top level management; NASATechTracS will be modified such that when a field center authorizes a success story for public release-there is an automatic completeness check for the mandatory datafields identified above. This automated feature will block the public release authorization if any of the required data fields are empty. Currently the plans are apply this automatic quality check to new success stories once the mod to NASATechTracS becomes operational.

An analysis is underway to determine a systematic process for collecting economic impact data that is tied to successful commercial applications of NASA derived technologies. It is most likely that such data will be tied directly to specific success stories with specific companies relating to specific NASA-derived technologies. This analysis will most likely add additional data and metrics to this area.

Appendices

Appendix A

Regional Technology Transfer Centers

Below are brief descriptions of all six RTTCs and a few examples of companies that have benefited from the services of the RTTCs. You can reach the RTTC in your region toll-free by calling 800-472-6785.

The Northeast
508-870-0042

The Center for Technology Commercialization (CTC) in Westborough, Massachusetts, manages NASA's RTTC in the Northeast. CTC works with regional companies to obtain and commercialize NASA/federal laboratory-, industry- and university-developed technologies, with a focus on technologies and facilities located at the Goddard Space Flight Center. CTC has eight Satellite Technology Transfer Centers located throughout the six New England states, New York and New Jersey. CTC's network of experienced, technically trained business personnel listen to the specific needs of its industrial clients and find solutions that best match these needs.

CTC helps companies acquire technology for new or improved products and processes, identify markets and customers for innovative products, capture Small Business Innovation Research (SBIR) and other federal contracts and form strategic partnerships to accelerate products to market. Many clients gain needed information through CTC's Technical Information Center, which has access to databases on technologies, markets, patents and the like. CTC has a unique NASA Business Outreach Program, which acts as an advocate on behalf of Northeast business firms to secure NASA contract opportunities. Special emphasis is placed on helping small, minority- and women-owned businesses identify research and program areas where their products and services can be applied.

The Midwest
440-734-0094

The Great Lakes Industrial Technology Center (GLITeC) in Cleveland, Ohio, offers companies within its six-state region technology-based problem solving and commercialization assistance services. Through these services, GLITeC helps Midwest companies identify, acquire, adapt and utilize NASA and other federal technology. GLITeC has been able to help more than 2,100 Great Lakes companies meet their technology needs.

To ensure the commercial application of federal technology, GLITeC develops and implements specific programs. GLITeC uses the *Technology Dialogue Over Lunch*series to create relationships between NASA's Lewis Research Center and Ohio industry. The lunches allow industry to learn about the commercial potential of Lewis technologies. GLITeC also offers a variation on the luncheon series, *Technology Dialogue Over Breakfast*, to Minnesota companies. GLITeC is now expanding the Technology Dialogue program throughout the region. Because of the success of the GLITeC/NASA Lewis Advanced Coatings and Surface Texturing Consortium, which has helped companies evaluate and develop surface treatments, GLITeC has organized another consortium. The Consortium for the Design and Analysis of Composites highlights Lewis software and allows researchers from both Lewis and Battelle Memorial Institute to address jointly the composite material design needs of the nonaerospace industry.

In addition to working with NASA, GLITeC has teamed with the Midwest federal laboratories to foster greater use of NASA and other federal technology by linking with selected key industry groups. Through the Focus Industry Technology Transfer (FITT) project, Midwest laboratories work with industry associations (which have significant membership in the Midwest region) to meet the technology needs of their constituencies. GLITeC also uses the Strategic Technology Evaluation Program (STEP) to identify commercial applications and develop commercialization strategies for NASA-developed inventions. GLITeC participates in the RIBIT (Re-invention Initiative Between Industry and Technology) program, which evaluates and commercializes federal laboratory technology.

The Southeast
352-294-7822

The Southern Technology Applications Center (STAC), headquarters at the University of Florida's College of Engineering in Alachua, Florida, is also part of the national network of technology transfer resources and expertise. STAC is supported by the state university system of Florida, as well as NASA, to expedite technology transfer and economic development through affiliates in the nine states of the U.S. Southeast: Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina and Tennessee.

STAC's mission is threefold. In the private sector, STAC works to increase productivity and competitiveness through the development of innovative applications of technology and critical knowledge. STAC's services are tailored to provide specialized assistance that help companies gain an edge in developing and commercializing technology. Services include technical assistance, technology locating, licensing and collaborative agreement development, technology/market assessments and commercialization. STAC also assists small, innovative companies to participate in the (SBIR) program, the STTR program and other state and federal programs to obtain seed capital for developing proprietary technologies and marketing them to the commercial sector.

In the public sector, STAC serves as a delivery mechanism to transfer federally and state funded R&D to the private, academic and public sectors. As a partner in the NASA Southeast Technology Transfer Alliance, STAC works closely with three NASA field centers-the Marshall Space Flight Center, the Kennedy Space Center, and the Stennis Space Center-to facilitate the use of NASA technologies, expertise and facilities by industry. The alliance provides companies with access to NASA technical problem solving capabilities.

The Far West
213-743-2353

Far West Technology Transfer Center, headquarters at the University of Southern California in Los Angeles, provides regional industry with access to NASA and federally developed technologies. The center focuses on linking companies with NASA and federal laboratories to license technology and/or enter into cooperative development arrangements. It assists companies with memoranda of understanding, technology cooperative agreements, Space Act agreements and cooperative research and development agreements.

The Far West RTTC forges alliances with state and local government agencies, such as economic development agencies and small business development centers. It is developing regional technology alliances that will speed the process of technology commercialization and boost industry development in the western United States. For example, the Far West RTTC assisted in the design of and chaired a Medical Roundtable that was held at NASA's Jet Propulsion Laboratory (JPL). Key medical industry stakeholders from hospitals, academia, and the manufacturing community convened to review current medical industry needs and relevant NASA technology that might lead to co-development projects or the commercialization of existing technology.

The Far West RTTC strengthens the links it builds and expands the market for NASA and federal technology by providing specialty services. Market analyses, strategic alliance building and technology evaluations are examples of services provided directly to firms that are in the process of adopting NASA or federal technology. Recently, the Far West RTTC assisted a minority-based firm that is using new technology to improve on the design and performance of a communications satellite that is scheduled for launch this year. Because the firm's needs matched the existing capabilities of JPL, the center introduced the company to JPL's Technology Affiliates Program. JPL was then able to provide recommendations regarding design, implementation and areas of risks.

The Mid-Continent
409-845-2907

Headquartered at the Texas Engineering Extension Service (TEEX) of the Texas A&M University System in College Station, Texas, the Mid-Continent Technology Transfer Center (MCTTC) is a consortium that provides public and private affiliates with the tools, expertise and resources to grow and compete on a national level. Major consortium participants include TEEX's Technology and Economic Development Division, the University of Houston at Clear Lake, the Midwest Research Institute, SaraTech Finance, Inc., and the Economic Council of St. Louis County.

MCTTC facilitates technology commercialization by identifying technology markets, resolving industry problems and matching the mission of federal laboratories with the interests of the private sector. The strength of MCTTC and its staff has paid off in numerous fields. A recent success was the facilitation of the development of a laser-guided inspection system that measures oil-pipe thread and tolerances 10 times more accurately than the best conventional methods. The key component of the system is a linear table developed for NASA's Johnson Space Center that keeps the laser stable as it passes over the thread profile.

MCTTC also helped a company exploring industrial markets for defense-related products pursue an exclusive field-of-use license and a cooperative research and development agreement with the National Institute of Standards and Technology (NIST). The agreement was made possible once MCTTC located a NIST monitor for gas metal arc welding. MCTTC also enlisted the aid of a federal laboratory for the company.

The Mid-Atlantic
412-383-2525

The Mid-Atlantic Technology Applications Center in Pittsburgh, Pennsylvania works one-on-one with U.S. firms to improve their competitiveness by >assisting them in the location, assessment, acquisition, utilization and commercialization of

technologies and expertise in the federal laboratory system. Positioned at the center of a vast information network, MTAC can tap into a wide variety of resources to supply clients with a "virtual" R&D capability.

Acquiring and then adapting new technologies is a complex process, with many chances for the process to go astray. MTAC is a champion for its clients, providing support and guidance from initial inquiry to market. "Cradle to Success" service -- the satisfactory completion of a client's technology acquisition -- is MTAC's highest priority.

The Fire Fighting Task Force is an exciting project organized and led by MTAC. After a tragic fire in Pittsburgh which killed three firefighters, MTAC approached the fire chief with a proposal to create a task force for the development of new or improved fire fighting equipment. The idea was favorably received and the FFTF was established. FFTF members include nine fire bureaus from across the country and 20 federal laboratories

Several priority areas were established and a potential solution to firefighters' communications difficulties was found in the Naval Surface Warfare Center at Panama City, FL. Two prototypes of the "forehead-contact helmet microphone" have been developed and demonstrate, drawing extremely postive reviews from firefighters who tested the helmet in the field and Metro Fire Chiefs who witnessed a demo at their 1998 national conference in San Diego. A NASA Langley technology is being considered to further enhance the microphone.

Licensing discussions with manufacturers are on-going. Ultimately, the result of this effort will be a life-saving new product that improves on currently available equipment in both ease of use and cost.

Appendix B

Sample Technology Commercialization Plan Format

What is a "Commercialization Plan"?

A plan for a commercial product is a tool whose function is to not only serve internal management needs, but also to supply information to external organizations who may be critical to success. The plan should be used as a roadmap that establishes objectives, strategies and an approach to achieving those objectives. Utilizing such a roadmap not only facilitates internal communications, but encourages staying the planned course. Of major importance is that the Commercialization Plan should be reviewed frequently and to remain useful needs to be updated accordingly. *Always remember that for help with any aspect of a Commercialization Plan, contact your Center's Commercial Technology Program Office.*

So, what needs to be in it?

There are several standard sections that should appear in every Commercialization Plan. The important thing to remember is to customize it to fit your particular venture. The following sections are a good guideline to start your first plan:

Executive Summary
This may very well be the most important section of your plan. Often times the Executive Summary is the ONLY portion of a Commercialization Plan that is read by outside sources. You need to ensure that you capture your audience and create interest, while being informative and concise about your venture. Describe your product's unique competitive advantage, progress to date and development and technical milestones.

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Product Description
Clearly describe your commercial product in terms that any "layperson" could understand. This should include how the product will benefit the customer (what is its uniqueness), current stage of development, potential development obstacles and intellectual property information.

Target Market and Competition
This section should demonstrate strong market knowledge and list those market area(s) to be targeted. Included in this section should be market analysis and research reports that show the market need for the particular product and lists key customers.

Project Description
Clearly describe your project and where and how it fits into the strategic planning of the parent entity (e.g., flight project). How and where is this technology being used.

Management Description
Identify the key business and technical management personnel. Include technical experience and skills, and show how these individuals give a distinct competitive advantage to the venture.

Operations
Describe the plan to develop and/or produce the end product, demonstrating an understanding of the technologies that will be applied to produce the planned product.

Appendices
Include any relevant attachments (e.g., patents, market research studies, agreements)

Appendix C

FAR Clauses

TITLE 48--FEDERAL ACQUISITION REGULATIONS SYSTEM
CHAPTER 1--FEDERAL ACQUISITION REGULATION
PART 27--PATENTS, DATA, AND COPYRIGHTS

Sec. 27.000 Scope of part.

This part prescribes policies, procedures, and contract clauses pertaining to patents and directs agencies to develop coverage for Rights in Data and Copyrights.

Subpart 27.1--General

Sec. 27.101 Applicability.

The policies, procedures, and clauses prescribed by this part 27 are applicable to all agencies. Agencies are authorized to adopt alternate policies, procedures, and clauses, but only to the extent determined necessary to meet the specific requirements of laws, executive orders, treaties, or international agreements. Any agency action adopting such alternate policies, procedures, and clauses shall be covered in published agency regulations.

Sec. 27.103 Policy.

The policies pertaining to patents, data, and copyrights are set forth in this part 27 and the related clauses in part 52.

Sec. 27.104 General guidance.

(a) The Government encourages the maximum practical commercial use of inventions made while performing Government contracts.
(b) Generally, the Government will not refuse to award a contract on the grounds that the prospective contractor may infringe a patent.
(c) Generally, the Government encourages the use of inventions in performing contracts and, by appropriate contract clauses, authorizes and consents to such use, even though the inventions may be covered by U.S. patents and indemnification against infringement may be appropriate.
(d) Generally, the Government should be indemnified against infringement of U.S. patents resulting from performing contracts when the supplies or services acquired under the contracts normally are or have been sold or offered for sale by any supplier to the public in the commercial open market or are the same as such supplies or services with relatively minor modifications.
(e) The Government acquires supplies or services on a competitive basis in accordance with part 6, but it is important that the efforts directed toward full and open competition not improperly demand or use data relating to private developments.
(f) The Government honors the rights in data resulting from private developments and limits its demands for such rights to those essential for Government purposes.
(g) The Government honors rights in patents, data, and copyrights, and complies with the stipulations of law in using or acquiring such rights.
(h) Generally, the Government requires that contractors obtain permission from copyright owners before including privately-owned copyrighted works in data required to be delivered under Government contracts.

Subpart 27.3--Patent Rights Under Government Contracts

Sec. 27.300 Scope of subpart.

This subpart prescribes policies, procedures, and contract clauses with respect to inventions made in the performance of work under a Government contract or subcontract thereunder if a purpose of the contract or subcontract is the conduct of experimental, developmental, or research work, except to the extent statutory requirements necessitate different agency policies, procedures, and clauses as specified in agency supplemental regulations.

Sec. 27.301 Definitions.

Invention, as used in this subpart, means any invention or discovery that is or may be patentable or otherwise protectable under title 35 of the U.S. Code or any novel variety of plant that is or may be protectable under the Plant Variety Protection Act (7 U.S.C. 2321, et seq.).
Made, as used in this subpart, when used in relation to any invention, means the conception or first actual reduction to practice of such invention.
Nonprofit organization, as used in this subpart, means a domestic university or other institution of higher education or an organization of the type described in section 501(c)(3) of the Internal Revenue Code of 1954 (26 U.S.C. 501(c)) and exempt from taxation under section 501(a) of the Internal Revenue Code (26 U.S.C. 501(a)), or any nonprofit scientific or educational organization qualified under a State nonprofit organization statute.
Practical application, as used in this subpart, means to manufacture, in the case of a composition or product; to practice, in the case of a process or method; or to operate, in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.
Small business firm, as used in this subpart, means a small business concern as defined at 15 U.S.C. 632 and implementing regulations of the Administrator of the Small Business Administration. (For the purpose of this definition, the size standard contained in 13 CFR 121.3-8 for small business contractors and in 13 CFR 121.3-12 for small business subcontractors will be used. See FAR part 19).
Subject invention, as used in this subpart, means any invention of the contractor conceived or first actually reduced to practice in the performance of work under a Government contract; provided, that in the case of a variety of plant, the date of determination defined in section 41(d) of the Plant Variety Protection Act, 7 U.S.C. 2401(d), must also occur during the period of contract performance.

[49 FR 12974, Mar. 30, 1984, as amended at 54 FR 25063, June 12, 1989 and 55 FR 25525, June 21, 1990]

Sec. 27.302 Policy.

(a) *Introduction*. (1) The policy of this section is based on Chapter 18 of title 35, U.S.C. (Pub. L. 95-517, Pub. L. 98-620, 37 CFR part 401), the Presidential Memorandum on Government Patent Policy to the Heads of Executive Departments and Agencies dated February 18, 1983, and Executive Order 12591, which provides that, to the extent permitted by law, the head of each Executive Department and agency shall promote the commercialization, in accord with the Presidential Memorandum, of patentable results of federally funded research by granting to all contractors, regardless of size, the title to patents made in whole or in part with Federal funds, in exchange for royalty-free use by or on behalf of the Government. The objectives of this policy are to use the patent system to promote the utilization of inventions arising from federally supported research or development; to encourage maximum participation of industry in federally supported research and development efforts; to ensure that these inventions are used in a manner to promote free competition and enterprise; to promote the commercialization and public availability of the inventions made in the United States by United States industry and labor; to ensure that the Government obtains sufficient rights in federally supported inventions to meet the needs of the Government and protect the public against nonuse or unreasonable use of inventions; and, to minimize the costs of administering policies in this area.
(b) *Contractor right to elect title*. Under the policy set forth in paragraph (a) of this section, each contractor may, after disclosure to the Government as required by the patent rights clause included in the contract, elect to retain title to any invention made in the performance of work under the contract. To the extent an agency's statutory requirements necessitate a different policy, or different procedures and/or contract clauses to effectuate the policy set forth in paragraph (a) of this section, such policy, procedures, and clauses shall be contained in or expressly referred to in that agency's supplement to this subpart. In addition, a contract may provide otherwise (1) when the contractor is not located in the United States or does not have a place of business located in the United States or is subject to the control of a foreign-government (see 27.303(c)), (2) in exceptional circumstances when it is determined by the agency that restriction or elimination of the right to retain title in any subject invention will better promote the policy and objectives of Chapter 18 of title 35, U.S.C. and the Presidential Memorandum, (3) when it is determined by a Government authority which is authorized by statute or Executive order to conduct foreign intelligence or counterintelligence activities that the restriction or elimination of the right to retain title to any subject invention is necessary to protect the security of such activities, or (4) when the contract includes the operation of a Government-owned, contractor-operated facility of the Department of Energy primarily dedicated to the Department's naval nuclear propulsion or weapons related programs and all funding agreement limitations under 35 U.S.C. 202(a)(iv) for agreements with small business firms and nonprofit organizations are limited to inventions occurring under the above two programs.
In the case of small business firms and nonprofit organizations, when an agency justifies and exercises the exception at subparagraph (b)(2) of this section on the basis of national security, the contract shall provide the contractor with the right to elect ownership to any invention made under such contract as provided by the clause at 52.227-11, Patent Rights--Retention by the Contractor (Short Form), if the invention is not classified by the agency within 6 months of the date it is reported to the agency, or within the same time period the Department of Energy (DOE) does not, as authorized by regulation, law or Executive order or implementing regulations thereto, prohibit unauthorized dissemination of the invention. Contracts in support of DOE's naval nuclear propulsion program are exempted from this paragraph. When a contract involves a series of separate task orders, an agency may apply the exceptions at subparagraph (b) (2) or (3) of this section to individual task orders, and it may structure the contract so

that modified patent rights clauses will apply to the task order even though the clause at 52.227-11 is applicable to the remainder of the work. In those instances when the Government has the right to acquire title at the time of contracting, the contractor may, nevertheless, request greater rights to an identified invention (see 27.304-1(a)). The right of the contractor to retain title shall, in any event, be subject to the provisions of paragraphs (c) through (g) of this section.

(c) *Government license*. The Government shall have at least a nonexclusive, nontransferable, irrevocable, paid-up license to practice, or have practiced for or on behalf of the United States, any subject invention throughout the world; and may, if provided in the contract (see Alternative I of the applicable patent rights clause), have additional rights to sublicense any foreign government or international organization pursuant to existing treaties or agreements identified in the contract, or to otherwise effectuate such treaties or agreements. In the case of long term contracts, the contract may also provide (see Alternate II) such rights with respect to treaties or agreements to be entered into by the Government after the award of the contract.

(d) *Government right to receive title*. (1) The Government has the right to receive title to any invention if the contract so provides pursuant to a determination made in accordance with subparagraph (b) (1), (2), (3), or (4) of this section. In addition, to the extent provided in the patent rights clause, the Government has the right to receive title to an invention--

(i) If the contractor has not disclosed the invention within the time specified in the clause;

(ii) In any country where the contractor does not elect to retain rights or fails to elect to retain rights to the invention within the time specified in the clause;

(iii) In any country where the contractor has not filed a patent application within the time specified in the clause;

(iv) In any country where the contractor decides not to continue prosecution of a patent application, pay maintenance fees, or defend in a reexamination or opposition proceeding on the patent; and/or

(v) In any country where the contractor no longer desires to retain title.

(2) For the purposes of this paragraph, election or filing in a European Patent Office Region or under the Patent Cooperation Treaty constitutes election or filing in any country covered therein to meet the times specified in the clause, provided that the Government has the right to receive title in those countries not subsequently designated by the contractor.

(e) *Utilization reports*. The Government shall have the right to require periodic reporting on the utilization or efforts at obtaining utilization that are being made by the contractor or its licensees or assignees. Such reporting by small business firms and nonprofit organizations may be required in accordance with instructions as may be issued by the Department of Commerce. Agencies should protect the confidentiality or utilization reports which are marked with restrictions to the extent permitted by 35 U.S.C. 205 or other applicable laws and 37 CFR part 401. Agencies shall not disclose such utilization reports to persons outside the Government without permission of the contractor. Contractors will continue to provide confidential markings to help prevent inadvertent release outside the agency.

(f) *March-in rights*. (1) With respect to any subject invention in which a contractor has acquired title, contracts provide that the agency shall have the right (unless provided otherwise in accordance with 27.304-1(f)) to require the contractor, an assignee, or exclusive licensee of a subject invention to grant a nonexclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant or applicants, upon terms that are reasonable under the circumstances, and if the contractor, assignee, or exclusive licensee refuses such request, to grant such a license itself, if the agency determines that such action is necessary--

(i) Because the contractor or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the subject invention in such field of use;

(ii) To alleviate health or safety needs which are not reasonably satisfied by the contractor, assignee, or their licensees;

(iii) To meet requirements for public use specified by Federal regulations and such requirements are not reasonably satisfied by the contractor, assignee, or licensees; or

(iv) Because the agreement required by paragraph (g) below has neither been obtained nor waived, or because a licensee of the exclusive right to use or sell any subject invention in the United States is in breach of its agreement obtained pursuant to paragraph (g) below.

(2) This right of the agency shall be exercised only after the contractor has been provided a reasonable time to present facts and show cause why the proposed agency action should not be taken, and afforded an opportunity to take appropriate action if the contractor wishes to dispute or appeal the proposed action, in accordance with 27.304-1(g).

(g) *Preference for United States industry*. Unless provided otherwise in accordance with 27.304-1(f), contracts provide that no contractor which receives title to any subject invention and no assignee of any such contractor shall grant to any person the exclusive right to use or sell any subject invention in the United States unless such person agrees that any products embodying the subject invention or produced through the use of the subject invention will be manufactured substantially in the United States. However, in individual cases, the requirement for such an agreement may be waived by the agency upon a showing by the contractor or assignee that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible.

(h) *Small business preference*. (1) Nonprofit organization contractors are expected to use efforts that are reasonable under the circumstances to attract small business licensees. They are also expected to give small business firms that meet the standard outlined in the clause at 52.227-11, Patent Rights--Retention by the Contractor (Short Form), a preference over other applicants for licenses. What constitutes reasonable efforts to attract small business licensees will vary with the circumstances and the nature, duration, and expense of efforts needed to bring the invention to the market. Subparagraph (k)(4) of the clause is not intended, for example, to prevent nonprofit organizations from providing larger firms with a right of first refusal or other options in inventions that relate to research being supported under long-term or other arrangements with larger companies. Under such circumstances, it would not be reasonable to seek and to give a preference to small business licensees.

(2) Small business firms that believe a nonprofit organizations is not meeting its obligations under the clause may report their concerns to the Secretary of Commerce. To the extent deemed appropriate, the Secretary of Commerce will undertake informal investigation of the concern, and, if appropriate, enter into discussions or negotiations with the nonprofit organization to the end of improving its efforts in meeting its obligations under the clause. However, in no event will the Secretary of Commerce intervene in ongoing negotiations or contractor decisions concerning the licensing of a specific subject invention. All the above investigations, discussions, and negotiations of the Secretary of Commerce will be in coordination with other interested agencies, including the Small Business Administration; and in the case of a contract for the operation of a Government-owned, contractor-operated research or production facility, the Secretary of Commerce will coordinate with the agency responsible for the facility prior to any discussions or negotiations with the contractor.

(i) *Minimum rights to contractor*. (1) When the Government acquires title to a subject invention, the contractor is normally granted a revocable, nonexclusive, royalty-free license to that invention throughout the world. The contractor's license extends to its domestic subsidiaries and affiliates, if any, within the corporate structure of which the contractor is a part and includes the right to grant sublicenses of the same scope to the extent the contractor was legally obligated to do so at the time the contract was awarded. The license is transferable only with the approval of the contracting officer except when transferred to the successor of that part of the contractor's business to which the invention pertains.

(2) The contractor's domestic license may be revoked or modified to the extent necessary to achieve expeditious practical application of the subject invention pursuant to an application for an exclusive license submitted in accordance with the applicable provisions in the Federal Property Management Regulations and agency licensing regulations. This license will not be revoked in that field of use or the geographical areas in which the contractor has achieved practical application and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified to the extent the contractor, its licensees, or its domestic subsidiaries or affiliates have failed to achieve practical application in that country. See the procedures at 27.304-1(e).

(j) *Confidentiality* of inventions. The publication of information disclosing an invention by any party before the filing of a patent application may create a bar to a valid patent. Accordingly, 35 U.S.C. 205 and 37 CFR part 401 provide that Federal agencies are authorized to withhold from disclosure to the public information disclosing any invention in which the Federal Government owns or may own a right, title, or interest (including a nonexclusive license) for a reasonable time in order for a patent application to be filed. Furthermore, Federal agencies shall not be required to release copies of any document which is part of an application for patent filed with the United States Patent and Trademark Office or with any foreign patent office. The Presidential Memorandum on Government Patent Policy specifies that agencies should protect the confidentiality of invention disclosures and patent applications required in performance or in consequence of awards to the extent permitted by 35 U.S.C. 205 or other applicable laws.

[49 FR 12974, Mar. 30, 1984, as amended at 50 FR 1743, Jan. 11, 1985; 50 FR 52429, Dec. 23, 1985; 51 FR 2665, Jan. 17, 1986; 54 FR 25063, June 12, 1989 and 55 FR 25525, June 21, 1990]

Sec. 27.305-1 Patent rights follow-up.

(a) It is important that the Government and the contractor know and exercise their rights in inventions conceived or first actually reduced to practice in the course of or under Government contracts in order to ensure their expeditious availability to the public and to enable the Government, the contractor, and the public to avoid unnecessary payment of royalties and to defend themselves against claims and suits for patent infringement. To attain these ends, contracts having a patent rights clause should be so administered that--

(1) Inventions are identified, disclosed, and reported as required by the contract, and elections are made;

(2) The rights of the Government in such inventions are established; (3) Where patent protection is appropriate, patent applications are timely filed and prosecuted by contractors or by the Government;

(4) The rights of the Government in filed patent applications are documented by formal instruments such as licenses or assignments; and

(5) Expeditious commercial utilization of such inventions is achieved.

(b) If a subject invention is made under funding agreements of more than one agency, at the request of the contractor or on their own initiative, the agencies shall designate one agency as responsible for administration of the rights of the Government in the invention.

Sec. 27.305-2 Follow-up by contractor.

(a) *Contractor procedures*. If required by the applicable clause, the contractor shall establish and maintain effective procedures to ensure its patent rights obligations are met and that subject inventions are timely identified and disclosed, and when appropriate, patent applications are filed.

(b) *Contractor reports*. Contractors shall submit all reports required by the patent rights clause to the contracting officer or other representative designated for such purpose in the contract. Agencies may, in their implementing instructions, provide specific forms for use on an optional basis for such reporting.

ec. 27.305-3 Follow-up by Government.

(a) Agencies shall maintain appropriate follow-up procedures to protect the Government's interest and to check that subject inventions are identified and disclosed, and when appropriate, patent applications are filed, and that the Government's rights therein are established and protected. Follow-up activities for contracts that include a clause referenced in 27.304-2 shall be coordinated with the appropriate agency.
(b) The contracting officer administering the contract (or other representative specifically designated in the contract for such purpose) is responsible for receiving invention disclosures, reports, confirmatory instruments, notices, requests, and other documents and information submitted by the contractor pursuant to a patent rights clause. If the contractor fails to furnish documents or information as called for by the clause within the time required, the contracting officer shall promptly request the contractor to supply the required documents or information and, if the failure persists, shall take appropriate action to secure compliance. Invention disclosures, reports, confirmatory instruments, notices, requests, and other documents and information relating to patent rights clauses shall be promptly furnished by the contracting officer administering the contract (or other designee) to the procuring agency or contracting activity for which the procurement was made for appropriate action.
(c) Contracting activities shall establish appropriate procedures to detect and correct failures by the contractor to comply with its obligations under the patent rights clauses, such as failures to disclose and report subject inventions, both during and after contract performance. Ordinarily a contractor should have written instructions for its employees covering compliance with these contract obligations. Government effort to review and correct contractor compliance with its patent rights obligations should be directed primarily towards contracts that, because of the nature of the research, development, or experimental work or the large dollar amount spent on such work, are more likely to result in subject inventions significant in number or quality, and towards contracts when there is reason to believe the contractors may not be complying with their contractual obligations. Other contracts may be reviewed using a spot-check method, as feasible. Appropriate follow-up procedures and activities may include the investigation or review of selected contracts or contractors by those qualified in patent and technical matters to detect failures to comply with contract obligations.
(d) Follow-up activities should include, where appropriate, use of Government patent personnel--

(1) To interview agency technical personnel to identify novel developments made in contracts;

(2) To review technical reports submitted by contractors with cognizant agency technical personnel;

(3) To check the Official Gazette of the United States Patent and Trademark Office and other sources for patents issued to the contractor in fields related to its Government contracts; and

(4) If additional information is required, to have cognizant Government personnel interview contractor personnel regarding work under the contract involved, observe the work on site, and inspect laboratory notebooks and other records of the contractor related to work under the contract.

(e) If it is determined that a contractor or subcontractor does not have a clear understanding of the rights and obligations of the parties under a patent rights clause, or that its procedures for complying with the clause are deficient, a post-award orientation conference or letter should ordinarily be used to explain these rights and obligations (see subpart 42.5). When a contractor fails to establish, maintain, or follow effective procedures for identifying, disclosing, and, when appropriate, filing patent applications on inventions (if such procedures are required by the patent rights clause), or after appropriate notice fails to correct any deficiency, the contracting officer may require the contractor to make available for examination books, records, and documents relating to the contractor's inventions in the same field of technology as the contract effort to enable a determination of whether there are such inventions and may invoke the withholding of payments provision (if any) of the clause. The withholding of payments provision (if any) of the patent rights clause or of any other contract clause may also be invoked if the contractor fails to disclose a subject invention. Significant or repeated failures by a contractor to comply with the patent rights obligation in its contracts shall be documented and made a part of the general file (see 4.801(c)(3)).

Sec. 27.305-4 Conveyance of invention rights acquired by the Government.

(a) Agencies are responsible for those procedures necessary to protect the Government's interest in subject inventions. When the Government acquires the entire right, title, and interest in an invention by contract, this is normally accomplished by an assignment either from each inventor to the contractor and from the contractor to the Government, or from the inventor to the Government with the consent of the contractor, so that the chain of title from the inventor to the Government is clearly established. When the Government's rights are limited to a license, there should be a confirmatory instrument to that effect.
(b) The form of conveyance of title from the inventor to the contractor must be legally sufficient to convey the rights the contractor is required to convey to the Government. Agencies may, by supplemental instructions, develop suitable assignments, licenses, and other papers evidencing any rights of the Government in patents or patent applications, including such instruments as may be required to be recorded in the Statutory Register or documented in the Government Register maintained by the U.S. Patent and Trademark Office pursuant to Executive Order 9424, February 18, 1944.

Sec. 27.305-5 Publication or release of invention disclosures.

(a) In accordance with the policy at 27.302(i), to protect their mutual interests, contractors and the Government should cooperate in deferring the publication or release of invention disclosures until the filing of the first patent application, and use their best efforts to achieve prompt filing when publication or release may be imminent. The Government will, on its part and to the extent authorized by 35 U.S.C. 205, withhold from disclosure to the public any invention disclosures reported under the patent

rights clauses of 52.227-11, 52.227-12, or 52.227-13 for a reasonable time in order for patent applications to be filed. The policy in 27.302(i) regarding protection of confidentiality shall be followed.

(b) The Government will also use reasonable efforts to withhold from disclosure to the public for a reasonable time other information disclosing a reported invention included in any data delivered pursuant to contract requirements; *provided*, that the contractor notifies the agency as to the identity of the data and the invention to which it relates at the time of delivery of the data. Such notification must be to both the contracting officer and any patent representative to which the invention is reported, if other than the contracting officer.

(c) As an additional protection for small business firms and nonprofit organizations 37 CFR part 401 prescribes that agencies shall not disclose or release, in accordance with 35 U.S.C. 205, for a period of 18 months from the filing date of the application to third parties pursuant to request under the Freedom of Information Act or otherwise copies of any document which the agency obtained under contract which is part of an application for patent with the U.S. Patent and Trademark Office or any foreign patent office filed by the contractor (or its assignees, licensees, or employees) on a subject invention to which the contractor has elected to retain title. This prohibition does not extend to disclosure to other Government agencies or contractors of Government agencies under an obligation to maintain such information in confidence.

PART 52--SOLICITATION PROVISIONS AND CONTRACT CLAUSES
Subpart 52.2--Text of Provisions and Clauses

[**Note**: FAR Section 52.227-11, modified by NFS Section 1852.227-11, is used in all NASA contracts with a small business firm, college, university, or a nonprofit organization if a purpose of the contract is the performance of experimental, developmental, or research work. A similar clause is used in grants and cooperative agreements with small entities.]

Sec. 52.227-11 Patent Rights-Retention by the Contractor (Short Form).

As prescribed in 27.303(a), insert the following clause:

Patent Rights-Retention by the Contractor (Short Form) (Jun 1997)

(a) *Definitions*.

(1) Invention means any invention or discovery which is or may be patentable or otherwise protectable under title 35 of the United States Code, or any novel variety of plant which is or may be protected under the Plant Variety Protection Act (7 U.S.C. 2321, et seq.).

(2) Made when used in relation to any invention means the conception or first actual reduction to practice of such invention.

(3) Nonprofit organization means a university or other institution of higher education or an organization of the type described in section 501(c)(3) of the Internal Revenue Code of 1954 (26 U.S.C. 501(c)) and exempt from taxation under section 501(a) of the Internal Revenue Code (26 U.S.C. 501(a)) or any nonprofit scientific or educational organization qualified under a state nonprofit organization statute.

(4) Practical application means to manufacture, in the case of a composition of product; to practice, in the case of a process or method, or to operate, in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.

(5) Small business firm means a small business concern as defined at section 2 of Pub. L. 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration. For the purpose of this clause, the size standards for small business concerns involved in Government procurement and subcontracting at 13 CFR 121.3-8 and 13 CFR 121.3-12, respectively, will be used.

(6) Subject invention means any invention of the contractor conceived or first actually reduced to practice in the performance of work under this contract, provided that in the case of a variety of plant, the date of determination (as defined in section 41(d) of the Plant Variety Protection Act, 7 U.S.C. 2401(d)) must also occur during the period of contract performance.

(b) *Allocation of principal rights.* The Contractor may retain the entire right, title, and interest throughout the world to each subject invention subject to the provisions of this clause and 35 U.S.C. 203. With respect to any subject invention in which the Contractor retains title, the Federal Government shall have a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States the subject invention throughout the world.

(c) *Invention disclosure, election of title, and filing of patent application by contractor*. (1) The Contractor will disclose each subject invention to the Federal agency within 2 months after the inventor discloses it in writing to Contractor personnel responsible for patent matters. The disclosure to the agency shall be in the form of a written report and shall identify the contract under which the invention was made and the inventor(s). It shall be sufficiently complete in technical detail to convey a clear understanding to the extent known at the time of the disclosure, of the nature, purpose, operation, and the physical, chemical, biological or electrical characteristics of the invention. The disclosure shall also identify any publication, on sale or public use of the invention and whether a manuscript describing the invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. In addition, after disclosure to the agency, the contractor will promptly notify the agency of the acceptance of any manuscript describing the invention for publication or of any on sale or public use planned by the Contractor.

(2) The Contractor will elect in writing whether or not to retain title to any such invention by notifying the Federal agency within 2 years of disclosure to the Federal agency. However, in any case where publication, on sale or public use has initiated the 1 year statutory period wherein valid patent protection can still be obtained in the United States, the period for election of title may be shortened by the agency to a date that is no more than 60 days prior to the end of the statutory period.

(3) The Contractor will file its initial patent application on a subject invention to which it elects to retain title within 1 year after election of title, or, if earlier, prior to the end of any statutory period wherein valid patent protection can be obtained in the United States after a publication, on sale, or public use. The Contractor will file patent applications in additional countries or international patent offices within either 10 months of the corresponding initial patent application or 6 months from the date permission is granted by the Commissioner of Patents and Trademarks to file foreign patent applications where such filing has been prohibited by a Secrecy Order.

(4) Requests for extension of the time for disclosure election, and filing under subparagraphs (c) (1), (2), and (3) of this clause may, at the discretion of the agency, be granted.

(d) *Conditions when the government may obtain title*. The Contractor will convey to the Federal agency, upon written request, title to any subject invention--

(1) If the Contractor fails to disclose or elect title to the subject invention within the times specified in paragraph (c) of this clause, or elects not to retain title; provided, that the agency may only request title within 60 days after learning of the failure of the Contractor to disclose or elect within the specified times.

(2) In those countries in which the Contractor fails to file patent applications within the times specified in paragraph (c) of this clause; provided, however, that if the Contractor has filed a patent application in a country after the times specified in paragraph (c) of this clause, but prior to its receipt of the written request of the Federal agency, the Contractor shall continue to retain title in that country.

(3) In any country in which the Contractor decided not to continue the prosecution of any application for, to pay the maintenance fees on, or defend in reexamination or opposition proceeding on, a patent on a subject invention.

(e) *Minimum rights to Contractor and protection of the Contractor right to file.* (1) The Contractor will retain a nonexclusive royalty-free license throughout the world in each subject invention to which the Government obtains title, except if the Contractor fails to disclose the invention within the times specified in paragraph (c) of this clause. The Contractor's license extends to its domestic subsidiary and affiliates, if any, within the corporate structure of which the Contractor is a party and includes the right to grant sub-licenses of the same scope to the extent the Contractor was legally obligated to do so at the time the contract was awarded. The license is transferable only with the approval of the Federal Agency, except when transferred to the successor of that part of the Contractor's business to which the invention pertains.

(2) The Contractor's domestic license may be revoked or modified by the funding Federal agency to the extent necessary to achieve expeditious practical application of subject invention pursuant to an application for an exclusive license submitted in accordance with applicable provisions at 37 CFR part 404 and agency licensing regulations (if any). This license will not be revoked in that field of use or the geographical areas in which the Contractor has achieved practical application and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified at the discretion of the funding Federal agency to the extent the Contractor, its licensees, or the domestic subsidiaries or affiliates have failed to achieve practical application in that foreign country.

(3) Before revocation or modification of the license, the funding Federal agency will furnish the Contractor a written notice of its intention to revoke or modify the license, and the Contractor will be allowed 30 days (or such other time as may be authorized by the funding Federal agency for good cause shown by the Contractor) after the notice to show cause why the license should not be revoked or modified. The Contractor has the right to appeal, in accordance with applicable regulations in 37 CFR part 404 and agency regulations, if any, concerning the licensing revocation of modification of the license.

(f) *Contractor action to protect the government's interest.* (1) The Contractor agrees to execute or to have executed and promptly deliver to the Federal agency all instruments necessary to (i) establish or confirm the rights the government has throughout the world in those subject inventions to which the Contractor elects to retain title, and (ii) convey title to the Federal agency when requested under paragraph (d) of this clause and to enable the Government to obtain patent protection throughout the world in that subject invention.

(2) The Contractor agrees to require, by written agreement, its employees, other than clerical and nontechnical employees, to disclose promptly in writing to personnel identified as responsible for the administration of patent matters and in a format suggested by the Contractor each subject invention made under contract in order that the Contractor can comply with the disclosure provisions of paragraph (c) of this clause, and to execute all papers necessary to file patent applications on subject inventions and to establish the Government's rights in the subject inventions. This disclosure format should require, as a minimum, the information required by subparagraph (c)(1) of this clause. The Contractor shall instruct such employees, through employee agreements or other suitable educational programs, on the importance of reporting inventions in sufficient time to permit the filing of patent applications prior to U.S. or foreign statutory bars.

(3) The Contractor will notify the Federal agency of any decisions not to continue the prosecution of a patent application, pay maintenance fees, or defend in a reexamination or opposition proceeding on a patent, in any country, not less than 30 days before the expiration of the response period required by the relevant patent office.

(4) The Contractor agrees to include, within the specification of any United States patent application and any patent issuing thereon covering a subject invention, the following statement, ``The invention was made with Government support under (identify the contract) awarded by (identify the Federal agency). The Government has certain rights in the invention."

(g) *Subcontracts.* (1) The Contractor will include this clause, suitably modified to identify the parties, in all subcontracts, regardless of tier, for experimental, developmental, or research work to be performed by a small business firm or domestic nonprofit organization. The subcontractor will retain all rights provided for the Contractor in this clause, and the Contractor will not, as part of the consideration for awarding the subcontract, obtain rights in the subcontractor's subject inventions.

(2) The Contractor will include in all other subcontracts, regardless of tier, for experimental, developmental, or research work the patent rights clause required by subpart 27.3.

(3) In the case of subcontracts, at any tier, the agency, subcontractor, and the Contractor agree that the mutual obligations of the parties created by this clause constitute a contract between the subcontractor and the Federal agency with respect to the matters covered by the clause; provided, however, that nothing in this paragraph is intended to confer any jurisdiction under the Contract Disputes Act in connection with proceedings under paragraph (j) of this clause.

(h) *Reporting on utilization of subject inventions.* The Contractor agrees to submit, on request, periodic reports no more frequently than annually on the utilization of a subject invention or on efforts at obtaining such utilization that are being made by the Contractor or its licensees or assignees. Such reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received by the Contractor, and such other data and information as the agency may reasonably specify. The Contractor also agrees to provide additional reports as may be requested by the agency in connection with any march-in proceeding undertaken by the agency in accordance with paragraph (j) of this clause. As required by 35 U.S.C.

202(c)(5), the agency agrees it will not disclose such information to persons outside the Government without permission of the Contractor.

(i) *Preference for United States industry*. Notwithstanding any other provision of this clause, the Contractor agrees that neither it nor any assignee will grant to any person the exclusive right to use or sell any subject invention in the United States unless such person agrees that any product embodying the subject invention or produced through the use of the subject invention will be manufactured substantially in the United States. However, in individual cases, the requirement for such an agreement may be waived by the Federal agency upon a showing by the Contractor or its assignee that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible.

(j) *March-in rights*. The Contractor agrees that, with respect to any subject invention in which it has acquired title, the Federal agency has the right in accordance with the procedures in 37 CFR 401.6 and any supplemental regulations of the agency to require the Contractor, an assignee or exclusive licensee of a subject invention to grant a nonexclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant or applicants, upon terms that are reasonable under the circumstances, and if the Contractor, assignee, or exclusive licensee refuses such a request the Federal agency has the right to grant such a license itself if the Federal agency determines that--

(1) Such action is necessary because the Contractor or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the subject invention in such field of use;

(2) Such action is necessary to alleviate health or safety needs which are not reasonably satisfied by the Contractor, assignee, or their licensees;

(3) Such action is necessary to meet requirements for public use specified by Federal regulations and such requirements are not reasonably satisfied by the Contractor, assignee, or licensees; or

(4) Such action is necessary because the agreement required by paragraph (i) of this clause has not been obtained or waived or because a licensee of the exclusive right to use or sell any subject invention in the United States is in breach of such agreement.

(k) *Special provisions for contracts with nonprofit organizations*. If the Contractor is a nonprofit organization, it agrees that--

(1) Rights to a subject invention in the United States may not be assigned without the approval of the Federal agency, except where such assignment is made to an organization which has as one of its primary functions the management of inventions, provided that such assignee will be subject to the same provisions as the Contractor;

(2) The Contractor will share royalties collected on a subject invention with the inventor, including Federal employee co-inventors (when the agency deems it appropriate) when the subject invention is assigned in accordance with 35 U.S.C. 202(e) and 37 CFR 401.10;

(3) The balance of any royalties or income earned by the Contractor with respect to subject inventions, after payment of expenses (including payments to inventors) incidental to the administration of subject inventions will be utilized for the support of scientific research or education; and

(4) It will make efforts that are reasonable under the circumstances to attract licensees of subject inventions that are small business firms, and that it will give a preference to a small business firm when licensing a subject invention if the Contractor determines that the small business firm has a plan or proposal for marketing the invention which, if executed, is equally as likely to bring the invention to practical application as any plans or proposals from applicants that are not small business firms; provided, that the Contractor is also satisfied that the small business firm has the capability and resources to carry out its plan or proposal. The decision whether to give a preference in any specific case will be at the discretion of the contractor. However, the Contractor agrees that the Secretary of Commerce may review the Contractor's licensing program and decisions regarding small business applicants, and the Contractor will negotiate changes to its licensing policies, procedures, or practices with the Secretary of Commerce when the Secretary's review discloses that the Contractor could take reasonable steps to more effectively implement the requirements of this subparagraph (k)(4).

(l) *Communications*.

(Complete according to agency instructions.)

(End of clause)

Alternate I (JUN 1989). As prescribed in 27.303(a)(3), add the following sentence at the end of paragraph (b) of the basic clause:

The license shall include the right of the Government to sublicense foreign governments, their nationals and international organizations pursuant to the following treaties or international agreements: ------ *

[*Contracting Officer complete with the names of applicable existing treaties or international agreements. The above language is not intended to apply to treaties or agreements that are in effect on the date of the award but are not listed.]

Alternate II (JUN 1989). As prescribed in 27.303(a)(3), add the following sentence at the end of paragraph (b) of the basic clause:

The agency reserves the right to unilaterally amend this contract to identify specific treaties or international agreements entered into or to be entered into by the Government after the effective date of the contract and effectuate those license or other

rights which are necessary for the Government to meet its obligations to foreign governments, their nationals and international organizations under such treaties or international agreements with respect to subject inventions made after the date of the amendment.

Alternate III (JUN 1989). As prescribed in 27.303(a)(4), substitute the following in place of subparagraph (k)(3) of the basic clause:

(3) After payment of patenting costs, licensing costs, payments to inventors, and other expenses incidental to the administration of subject inventions, the balance of any royalties or income earned and retained by the Contractor during any fiscal year on subject inventions under this or any successor contract containing the same requirement, up to any amount equal to 5 percent of the budget of the facility for that fiscal year, shall be used by the Contractor for the scientific research, development, and education consistent with the research and development mission and objectives of the facility, including activities that increase the licensing potential of other inventions of the facility. If the balance exceeds 5 percent, 75 percent of the excess above 5 percent shall be paid by the Contractor to the Treasury of the United States and the remaining 25 percent shall be used by the Contractor only for the same purposes as described above. To the extent it provides the most effective technology commercialization, the licensing of subject inventions shall be administered by Contractor employees on location at the facility.

Alternate IV (JUN 1989). As prescribed in 27.303(a)(5), include the following subparagraph in paragraph (f) of the basic clause:

(5) The Contractor shall establish and maintain active and effective procedures to ensure that subject inventions are promptly identified and timely disclosed, and shall submit a description of the procedures to the Contracting Officer so that the Contracting Officer may evaluate and determine their effectiveness.

Appendix D

NASA Far Supplement Clauses (Partial Listing)

TITLE 48--FEDERAL ACQUISITION REGULATIONS SYSTEM
CHAPTER 18--NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PART 1827--PATENTS, DATA, AND COPYRIGHTS

1827.000 Scope of part.

This part prescribes NASA policies, procedures, and clauses pertaining to patents, data, and copyrights. The provisions of FAR Part 27 apply to NASA acquisitions unless specifically excepted in this part.

Subpart 1827.3--Patent Rights Under Government Contracts

1827.301 Definitions.

Administrator, as used in this subpart, means the Administrator of NASA or a duly authorized representative.
Contract, as used in this subpart, means any actual or proposed contract, agreement, understanding, or other arrangement, and includes any assignment, substitution of parties, or subcontract executed or entered into thereunder.
Made, in lieu of the definition in FAR 27.301, as used in this subpart, means conceived or first actually reduced to practice; provided that in the case of a variety of plant, the date of determination (as defined in Section 41(d) of the Plant Variety Protection Act, 7 U.S.C. 2401(d)) must also occur during the period of contract performance.
Reportable item, as used in this subpart, means any invention, discovery, improvement, or innovation of the contractor, whether or not patentable or otherwise protectible under Title 35 of the United States Code, made in the performance of any work under any NASA contract or on the performance of any work that is reimbursable under any clause in any NASA contract providing for reimbursement of costs incurred before the effective date of the contract.
Subject invention, in lieu of the definition in FAR 27.301, as used in this subpart, means any reportable item that is or may be patentable or otherwise protectible under Title 35 of the United States Code, or any novel variety of plant that is or may be protectible under the Plant Variety Protection Act (7 U.S.C. 2321 et seq.).

1827.302 Policy. (NASA supplements FAR paragraphs (a), (b), (c), (d), (e), (f), (g), and (i)).

(a) Introduction.
(i) NASA policy with respect to any invention, discovery, improvement, or innovation made in the performance of work under any NASA contract or subcontract with other than a small business firm or a nonprofit organization and the allocation to related property rights is based upon Section 305 of the National Aeronautics and Space Act of 1958, as amended (42 U.S.C. 2457) (the Act); and, to the extent consistent with this statute, the Presidential Memorandum or Government Patent Policy to the Heads of Executive Departments and Agencies, dated February 18, 1983, and Section 1(d)(4) of Executive Order 12591. NASA policy with respect to any invention made in the performance of experimental, developmental, or research work with a small business firm or a nonprofit organization is based on 35 U.S.C. Chapter 18, as amended.
(ii) NASA contracts subject to Section 305 of the Act shall ensure the prompt reporting of reportable items in other to protect the Government's interest and to provide widest practicable and appropriate dissemination, early utilization, expeditious development, and continued availability for the benefit of the scientific, industrial, and commercial communities and the general public.
(b) Contractor right to elect title.
(i) For NASA contracts, the contractor right to elect title only applies to contracts with small businesses and non-profit organizations. For other business entities, see subdivision (ii) of this paragraph.
(ii) Contractor right to request a waiver of title. For NASA contracts with other than a small business firm or a nonprofit organization (contracts subject to Section 305 of the Act), it is the policy of NASA to waive the rights (to acquire title) of the United States (with the reservation of a Government license set forth in FAR 27.302(c) and the march-in rights of FAR 27.302(f) and 1827.302(f)) in and to any subject invention if the Administrator determines that the interests of the United States will be served. This policy, as well as the procedures and instructions for such waiver of rights, is stated in the NASA Patent Waiver Regulations, 14 CFR Section 1245, Subpart 1. Waiver may be requested in advance of contract award for any or all of the subject inventions, or for individually identified subject inventions reported under the contract. When waiver of rights is granted, the contractor's right to title, the rights reserved by the Government, and other conditions and obligations of the waiver shall be included in an Instrument of Waiver executed by NASA and the party receiving the waiver.
(iii) It is also a policy of NASA to consider for a monetary award, when referred to the NASA Inventions and Contributions Board, any subject invention reported to NASA in accordance with this subpart, and for which an application for patent has been filed.

(c) Government license. For each subject invention made in the performance of work under a NASA contract with other than a small business firm or nonprofit organization and for which waiver of rights has been granted in accordance with 14 CFR Section 1245, Subpart 1, the Administrator shall reserve an irrevocable, nonexclusive, nontransferable, royalty-free license for the practice of such invention throughout the world by or on behalf of the United States or any foreign Government in accordance with any treaty or agreement of the United States.
(d) Government right to receive title. Under any NASA contract with other than a small business or nonprofit organization (i.e., those contracts subject to Section 305(a) of the Act), title to subject inventions vests in NASA when the determinations of Section 305(a)(1) or 305(a)(2) have been made. The Administrator may grant a waiver of title in accordance with 14 CFR Section 1245.
(e) Utilization reports. For any NASA contract with other than a small business firm or a nonprofit organization, the requirements for utilization reports shall be as set forth in the NASA Patent Waiver Regulations, 14 CFR Section 1245, Subpart 1, and any Instrument of Waiver executed under those Regulations.
(f) March-in rights. For any NASA contract with other than a small business firm or a nonprofit organization, the march-in rights shall be as set forth in the NASA Patent Waiver Regulations, 14 CFR Section 1245, Subpart 1, and any Instrument of Waiver executed under those Regulations.
(g) Preference for United States industry. Waiver of the requirement for the agreement for any NASA contract with other than a small business firm or a nonprofit organization shall be in accordance with the NASA Patent Waiver Regulations, 14 CFR Section 1245, Subpart 1.
(i) Minimum rights to contractor.
(1) For NASA contracts with other than a small business firm or a nonprofit organization (i.e., those contracts subject to Section 305(a) of the Act), where title to any subject inventions vests in NASA, the contractor is normally granted, in accordance with 14 CFR1245, a revocable, nonexclusive, royalty-free license in each patent application filed in any country and in any resulting patent. The license extends to any of the contractor's domestic subsidiaries and affiliates within the corporate structure, and includes the right to grant sublicenses of the same scope to the extent the contractor was legally obligated to do so at the time the contract was awarded. The license and right are transferable only with the approval of the Administrator, except when transferred to the successor of that part of the contractor's business to which the invention pertains.
(2) The Administrator is the approval authority for revoking or modifying a license. The procedures for revocation or modification are described in 37 CFR 404.10 and 14 CFR 1245.108.

1827.303-70 NASA solicitation provisions and contract clauses.

(a) When the clause at FAR 52.227-11 is included in a solicitation or contract, it shall be modified as set forth at 1852.227-11.
(b) The contracting officer shall insert the clause at 1852.227-70, New Technology, in all NASA solicitations and contracts with other than a small business firm or a nonprofit organization (i.e., those subject to section 305(a) of the Act), if the contract is to be performed in the United States, its possessions, or Puerto Rico and has as a purpose the performance of experimental, developmental, research, design, or engineering work. Contracts for any of the following purposes may be considered to involve the performance of work of the type described above (these examples are illustrative and not limiting):
(1) Conduct of basic or applied research.
(2) Development, design, or manufacture for the first time of any machine, article of manufacture, or composition of matter to satisfy NASA's specifications or special requirements.
(3) Development of any process or technique for attaining a NASA objective not readily attainable through the practice of a previously developed process or technique.
(4) Testing of, evaluation of, or experimentation with a machine, process, concept, or technique to determine whether it is suitable or could be made suitable for a NASA objective.
(5) Construction work or architect-engineer services having as a purpose the performance of experimental, developmental, or research work or test and evaluation studies involving such work.
(6) The operation of facilities or the coordination and direction of the work of others, if these activities involve performing work of any of the types described in subparagraphs (1) through (5) of this paragraph.
(c) The contracting officer shall insert the provision at 1852.227-71, Requests for Waiver of Rights to Inventions, in all solicitations that include the clause at 1852.227-70, New Technology (see paragraph (b) of this section).
(d) The contracting officer shall insert the clause at 1852.227-72, Designation of New Technology Representative and Patent Representative, in all solicitations and contracts containing either of the clauses at FAR 52.227-11, Patent Rights--Retention by the Contractor (Short Form) or 1852.227-70, New Technology (see paragraph (c) of this section). It may also be inserted, upon consultation with the installation intellectual property counsel, in solicitations and contracts using another patent rights clause. The New Technology Representative shall be the Technology Utilization Officer or the Staff member (by titled position) having cognizance of technology utilization matters for the installation concerned. The Patent Representative shall be the intellectual property counsel (by titled position) having cognizance of patent matters for the installation concerned.

1827.305 Administration of the patent rights clauses.

1827.305-3 Follow-up by Government.

1827.305-370 NASA patent rights and new technology follow-up procedures.

(a) For each contract containing a patent rights clause or the clause at 1852.227-70, New Technology, the contracting officer shall take the following actions:
(1) Furnish, or require the contractor to furnish directly, the New Technology Representative and the Patent Representative a copy of each contract (and modifications thereto), and copies of the final technical report, interim technical progress reports, and other pertinent material provided under the contract, unless the representatives indicate otherwise; and
(2) Notify the New Technology Representative as to which installation organizational element has technical cognizance of the contract.
(b) The New Technology Representative shall take the following actions:
(1) Review the technical progress of work performed under the contract to ascertain whether the contractor and its subcontractors are complying with the clause's reporting and record keeping requirements;
(2) Forward to the Patent Representative copies of all contractor and subcontractor written reports of reportable items and disclosures of subject inventions, and a copy of the written statement, if any, submitted with the reports.
(3) Consult with the Patent Representative whenever a question arises as to whether a given reportable item is to be considered a subject invention and whether it was made in the performance of work under the contract.
(4) Forward to the Patent Representative all correspondence relating to inventions and waivers under the New Technology clause or election of title under the Patent Rights--Retention by the Contractor (Short Form) clause.
(5) Upon receipt of any final report required by the clause, and upon determination that the contract work is complete, determine whether the contractor has complied with the clause's reporting requirements. If so, the New Technology Representative shall certify compliance, obtain the Patent Representative's concurrence, and forward the certification to the contracting officer.
(c) The Patent Representative shall review each reportable item to ascertain whether it is to be considered a subject invention, obtain any determinations required by paragraph (b) of the clause at 1852.227-70, New Technology, and notify the contractor. As to any subject invention, the Patent Representative shall:
(1) Ensure that the contractor has provided sufficient information to protect the Government's rights and interests in it and to permit the preparation, filing, and prosecution of patent applications;
(2) Determine inventorship;
(3) Ensure the preparation of instruments establishing the Government's rights' and
(4) Conduct selected reviews to ensure that subject inventions are identified, adequately documented, and timely reported or disclosed.
(d) Either the New Technology Representative or the Patent Representative, in consultation with the other, may prepare opinions, make determinations, and otherwise advise the contracting officer with respect to any withholding of payment under paragraph (g) of the clause at 1852.227-70, New Technology. Either the New Technology Representative or the Patent Representative may represent the contracting officer for the purpose of examining the contractor's books, records, and other documents in accordance with paragraph (f) of the clause and take corrective action as appropriate. However, no action may be taken by either the New Technology Representative or the Patent Representative that would constitute a final decision under the Disputes clause, involve any change or increase in the work required to be performed under the contact that is inconsistent with any right of appeal provided in FAR 27.304-5 or 14 CFR 1245, Subpart 1, or otherwise be outside the scope of the contract.
(e) The contracting officer shall not approve release of final payment under the contract and, if applicable, any reserve set aside under the withholding provisions of the clause for deficiencies and delinquent reporting not corrected as of the time of the submission of the final report by the contractor until receipt of the New Technology Representative's certification of compliance, and the Patent Representative's concurrence.

1827.305-371 New technology reporting plan.

In contracts with an estimated cost in excess of $2,500,000 (or less when appropriate) that contain the clause at 1852.227-70, New Technology, the contracting officer may require the contractor to submit for post-award Government approval a detailed plan for new technology reporting that demonstrates an adequate understanding of and commitment to the reporting requirements of the clause.

1827.305-4 Conveyance of invention rights acquired by the Government. (NASA supplements paragraph (a))

(a) When the Government acquires the entire right to, title to, and interest in an invention under the clause at 1852.227-70, New Technology, a determination of title is to be made in accordance with Section 305(a) of the National Aeronautics and Space Act of 1958, as amended (42 U.S.C. 2457(a)), and reflected in appropriate instruments executed by NASA and forwarded to the contractor.

TITLE 48--FEDERAL ACQUISITION REGULATIONS SYSTEM
CHAPTER 18--NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PART 1852--SOLICITATION PROVISIONS AND CONTRACT CLAUSES

Subpart 1852.2--Texts of Provisions and Clauses

[**Note**: FAR Section 52.227-11, modified by NFS Section 1852.227-11, is used in all NASA contracts with a small business firm, college, university, or a nonprofit organization if a purpose of the contract is the performance of experimental, developmental, or research work. A similar clause is used in grants and cooperative agreements with small entities.]

Sec. 1852.227-11 Patent Rights--Retention by the Contractor (Short Form).

As prescribed at 1827.303-70(a), modify the clause at FAR 52.227-11 by adding the following subparagraph (5) to paragraph (f) of the basic clause. In addition, use the following subparagraph (2) in lieu of subparagraph (g)(2) of the basic clause:

(5) The contractor shall provide the contracting officer the following:

(i) A listing every 12 months (or such longer period as the contracting officer may specify) from the date of the contract, of all subject inventions required to be disclosed during the period.

(ii) A final report prior to closeout of the contract listing all subject inventions or certifying that there were none.

(iii) Upon request, the filing date, serial number and title, a copy of the patent application, and patent number and issue date for any subject invention in any country in which the contractor has applied for patents.

(iv) An irrevocable power to inspect and make copies of the patent application file, by the Government, when a Federal Government employee is a coinventor.

(End of addition)

(2) The contractor shall include the clause in the NASA FAR Supplement at 1852.227-70, New Technology, suitably modified to identify the parties, in all subcontracts, regardless of tier, for experimental, developmental, research, design, or engineering work to be performed by other than a small business firm or nonprofit organization.

(End of substitution)

[**NOTE**: NFS Section 1852.227-70 is used in all NASA solicitations and contracts with large business firms (i.e., those subject to section 305(a) of the Act), if the contract is to be performed in the United States, its possessions, or Puerto Rico and has as a purpose the performance of experimental, developmental, research, design, or engineering work.]

Sec. 1852.227-70 New technology.

As prescribed in 1827.303-70(b), insert the following clause:

New Technology (July 1995)

(a) *Definitions*.

Administrator, as used in this clause, means the Administrator of the National Aeronautics and Space Administration (NASA) or duly authorized representative.

Contract, as used in this clause, means any actual or proposed contract, agreement, understanding, or other arrangement, and includes any assignment, substitution of parties, or subcontract executed or entered into thereunder.

Made, as used in this clause, means conception or first actual reduction to practice; provided, that in the case of a variety of plant, the date of determination (as defined in section 41(d) of the Plant Variety Protection Act, 7 U.S.C. 2401(d)) must also occur during the period of contract performance.

Nonprofit organization, as used in this clause, means a domestic university or other institution of higher education or an organization of the type described in section 501(c)(3) of the Internal Revenue Code of 1954 (26 U.S.C. 501(c)) and exempt from taxation under section 501(a) of the Internal Revenue Code (26 U.S.C. 501(a)), or any domestic nonprofit scientific or educational organization qualified under a State nonprofit organization statute.

Practical application, as used in this clause, means to manufacture, in the case of a composition or product; to practice, in the case of a process or method; or to operate, in case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.

Reportable item, as used in this clause, means any invention, discovery, improvement, or innovation of the Contractor, whether or not the same is or may be patentable or otherwise protectable under Title 35 of the United States Code, conceived or first actually reduced to practice in the performance of any work under this contract or in the performance of any work that is

reimbursable under any clause in this contract providing for reimbursement of costs incurred prior to the effective date of this contract.

Small business firm, as used in this clause, means a domestic small business concern as defined at 15 U.S.C. 632 and implementing regulations of the Administrator of the Small Business Administration. (For the purpose of this definition, the size standard contained in 13 CFR 121.3-8 for small business contractors and in 13 CFR 121.3-12 for small business subcontractors will be used.)

Subject invention, as used in this clause, means any reportable item which is or may be patentable or otherwise protectable under Title 35 of the United States Code, or any novel variety of plant that is or may be protectable under the Plant Variety Protection Act (7 U.S.C. 2321, et seq.).

(b) *Allocation of principal rights*--(1*) Presumption of title.* (i) Any reportable item that the Administrator considers to be a subject invention shall be presumed to have been made in the manner specified in paragraph (1) or (2) of section 305(a) of the National Aeronautics and Space Act of 1958 (42 U.S.C. 2457(a)) (hereinafter called “the Act”), and the above presumption shall be conclusive unless at the time of reporting the reportable item the Contractor submits to the Contracting Officer a written statement, containing supporting details, demonstrating that the reportable item was not made in the manner specified in paragraph (1) or (2) of section 305(a) of the Act.

(ii) Regardless of whether title to a given subject invention would otherwise be subject to an advance waiver or is the subject of a petition for waiver, the Contractor may nevertheless file the statement described in paragraph (b)(1)(i) of this clause. The Administrator will review the information furnished by the Contractor in any such statement and any other available information relating to the circumstances surrounding the making of the subject invention and will notify the Contractor whether the Administrator has determined that the subject invention was made in the manner specified in paragraph (1) or (2) of section 305(a) of the Act.

(2) *Property rights in subject inventions*. Each subject invention for which the presumption of paragraph (b)(1)(i) of this clause is conclusive or for which there has been a determination that it was made in the manner specified in paragraph (1) or (2) of section 305(a) of the Act shall be the exclusive property of the United States as represented by NASA unless the Administrator waives all or any part of the rights of the United States, as provided in paragraph (b)(3) of this clause.

(3) *Waiver of rights*. (i) Section 305(f) of the Act provides for the promulgation of regulations by which the Administrator may waive the rights of the United States with respect to any invention or class of inventions made or that may be made under conditions specified in paragraph (1) or (2) of section 305(a) of the Act. The promulgated NASA Patent Waiver Regulations, 14 CFR part 1245, subpart 1, have adopted the Presidential Memorandum on Government Patent Policy of February 18, 1983, as a guide in acting on petitions (requests) for such waiver of rights.

(ii) As provided in 14 CFR part 1245, subpart 1, Contractors may petition, either prior to execution of the contract or within 30 days after execution of the contract, for advance waiver of rights to any or all of the inventions that may be made under a contract. If such a petition is not submitted, or if after submission it is denied, the Contractor (or an employee inventor of the Contractor) may petition for waiver of rights to an identified subject invention within eight months of first disclosure of invention in accordance with paragraph (e)(2) of this clause, or within such longer period as may be authorized in accordance with 14 CFR 1245.105.

(c) *Minimum rights reserved by the Government*. (1) With respect to each subject invention for which a waiver of rights is applicable in accordance with 14 CFR part 1245, subpart 1, the Government reserves--

(i) An irrevocable, nonexclusive, nontransferable, royalty-free license for the practice of such invention throughout the world by or on behalf of the United States or any foreign government in accordance with any treaty or agreement with the United States; and

(ii) Such other rights as stated in 14 CFR 1245.107.

(2) Nothing contained in this paragraph (c) shall be considered to grant to the Government any rights with respect to any invention other than a subject invention.

(d) *Minimum rights to the Contractor*. (1) The Contractor is hereby granted a revocable, nonexclusive, royalty-free license in each patent application filed in any country on a subject invention and any resulting patent in which the Government acquires title, unless the Contractor fails to disclose the subject invention within the times specified in paragraph (e)(2) of this clause. The Contractor's license extends to its domestic subsidiaries and affiliates, if any, within the corporate structure of which the Contractor is a party and includes the right to grant sublicenses of the same scope to the extent the Contractor was legally obligated to do so at the time the contract was awarded. The license is transferable only with the approval of the Administrator except when transferred to the successor of that part of the Contractor's business to which the invention pertains.

(2) The Contractor's domestic license may be revoked or modified by the Administrator to the extent necessary to achieve expeditious practical application of the subject invention pursuant to an application for an exclusive license submitted in accordance with 37 CFR part 404, Licensing of Government Owned Inventions. This license will not be revoked in that field of use or the geographical areas in which the Contractor has achieved practical application and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified at the discretion of the Administrator to the extent the Contractor, its licensees, or its domestic subsidiaries or affiliates have failed to achieve practical application in that foreign country.

(3) Before revocation or modification of the license, the Contractor will be provided a written notice of the Administrator's intention to revoke or modify the license, and the Contractor will be allowed 30 days (or such other time as may be authorized by the Administrator for good cause shown by the Contractor) after the notice to show cause why the license should not be revoked or modified. The Contractor has the right to appeal to the Administrator any decision concerning the revocation or modification of its license.

(e) *Invention identification, disclosures, and reports.* (1) The Contractor shall establish and maintain active and effective procedures to assure that reportable items are promptly identified and disclosed to Contractor personnel responsible for the administration of this New Technology clause within six months of conception and/or first actual reduction to practice, whichever occurs first in the performance of work under this contract. These procedures shall include the maintenance of laboratory notebooks or equivalent records and other records as are reasonably necessary to document the conception and/or the first actual reduction to practice of the reportable items, and records that show that the procedures for identifying and disclosing reportable items are followed. Upon request, the Contractor shall furnish the Contracting Officer a description of such procedures for evaluation and for determination as to their effectiveness.

(2) The Contractor will disclose each reportable item to the Contracting Officer within two months after the inventor discloses it in writing to Contractor personnel responsible for the administration of this New Technology clause or, if earlier, within six months after the Contractor becomes aware that a reportable item has been made, but in any event for subject inventions before any on sale, public use, or publication of such invention known to the Contractor. The disclosure to the agency shall be in the form of a written report and shall identify the contract under which the reportable item was made and the inventor(s) or innovator(s). It shall be sufficiently complete in technical detail to convey a clear understanding, to the extent known at the time of the disclosure, of the nature, purpose, operation, and physical, chemical, biological, or electrical characteristics of the reportable item. The disclosure shall also identify any publication, on sale, or public use of any subject invention and whether a manuscript describing such invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. In addition, after disclosure to the agency, the Contractor will promptly notify the agency of the acceptance of any manuscript describing a subject invention for publication or of any on sale or public use planned by the Contractor for such invention.

(3) The Contractor shall furnish the Contracting Officer the following:

(i) Interim reports every 12 months (or such longer period as may be specified by the Contracting Officer) from the date of the contract, listing reportable items during that period, and certifying that all reportable items have been disclosed (or that there are no such inventions) and that the procedures required by paragraph (e)(1) of this clause have been followed.

(ii) A final report, within 3 months after completion of the contracted work, listing all reportable items or certifying that there were no such reportable items, and listing all subcontracts at any tier containing a patent rights clause or certifying that there were no such subcontracts.

(4) The Contractor agrees, upon written request of the Contracting Officer, to furnish additional technical and other information available to the Contractor as is necessary for the preparation of a patent application on a subject invention and for the prosecution of the patent application, and to execute all papers necessary to file patent applications on subject inventions and to establish the Government's rights in the subject inventions.

(5) The Contractor agrees, subject to section 27.302(i), of the Federal Acquisition Regulation (FAR), that the Government may duplicate and disclose subject invention disclosures and all other reports and papers furnished or required to be furnished pursuant to this clause.

(f) Examination of records relating to inventions. (1) The Contracting Officer or any authorized representative shall, until 3 years after final payment under this contract, have the right to examine any books (including laboratory notebooks), records, and documents of the Contractor relating to the conception or first actual reduction to practice of inventions in the same field of technology as the work under this contract to determine whether--

(i) Any such inventions are subject inventions;

(ii) The Contractor has established and maintained the procedures required by paragraph (e)(1) of this clause; and

(iii) The Contractor and its inventors have complied with the procedures.

(2) If the Contracting Officer learns of an unreported Contractor invention that the Contracting Officer believes may be a subject invention, the Contractor may be required to disclose the invention to the agency for a determination of ownership rights.

(3) Any examination of records under this paragraph will be subject to appropriate conditions to protect the confidentiality of the information involved.

(g) *Withholding of payment (this paragraph does not apply to subcontracts).* (1) Any time before final payment under this contract, the Contracting Officer may, in the Government's interest, withhold payment until a reserve not exceeding $50,000 or 5 percent of the amount of this contract, whichever is less, shall have been set aside if, in the Contracting Officer's opinion, the Contractor fails to--

(i) Establish, maintain, and follow effective procedures for identifying and disclosing reportable items pursuant to paragraph (e)(1) of this clause;

(ii) Disclose any reportable items pursuant to paragraph (e)(2) of this clause;

(iii) Deliver acceptable interim reports pursuant to paragraph (e)(3)(i) of this clause; or

(iv) Provide the information regarding subcontracts pursuant to paragraph (h)(4) of this clause.

(2) Such reserve or balance shall be withheld until the Contracting Officer has determined that the Contractor has rectified whatever deficiencies exist and has delivered all reports, disclosures, and other information required by this clause.

(3) Final payment under this contract shall not be made before the Contractor delivers to the Contracting Officer all disclosures of reportable items required by paragraph (e)(2) of this clause, and an acceptable final report pursuant to paragraph (e)(3)(ii) of this clause.

(4) The Contracting Officer may decrease or increase the sums withheld up to the maximum authorized above. No amount shall be withheld under this paragraph while the amount specified by this paragraph is being withheld under other provisions of the contract. The withholding of any amount or the subsequent payment thereof shall not be construed as a waiver of any Government rights.

(h) *Subcontracts*. (1) Unless otherwise authorized or directed by the Contracting Officer, the Contractor shall--

(i) Include this clause (suitably modified to identify the parties) in any subcontract hereunder (regardless of tier) with other than a small business firm or nonprofit organization for the performance of experimental, developmental, or research work; and

(ii) Include the clause at FAR 52.227-11 (suitably modified to identify the parties) in any subcontract hereunder (regardless of tier) with a small business firm or nonprofit organization for the performance of experimental, developmental, or research work.

(2) In the event of a refusal by a prospective subcontractor to accept such a clause the Contractor--

(i) Shall promptly submit a written notice to the Contracting Officer setting forth the subcontractor's reasons for such refusal and other pertinent information that may expedite disposition of the matter; and

(ii) Shall not proceed with such subcontract without the written authorization of the Contracting Officer.

(3) In the case of subcontracts at any tier, the agency, subcontractor, and Contractor agree that the mutual obligations of the parties created by this clause constitute a contract between the subcontractor and NASA with respect to those matters covered by this clause.

(4) The Contractor shall promptly notify the Contracting Officer in writing upon the award of any subcontract at any tier containing a patent rights clause by identifying the subcontractor, the applicable patent rights clause, the work to be performed under the subcontract, and the dates of award and estimated completion. Upon request of the Contracting Officer, the Contractor shall furnish a copy of such subcontract, and, no more frequently than annually, a listing of the subcontracts that have been awarded.

(5) The subcontractor will retain all rights provided for the Contractor in the clause of paragraph (h)(1)(i) or (ii) of this clause, whichever is included in the subcontract, and the Contractor will not, as part of the consideration for awarding the subcontract, obtain rights in the subcontractor's subject inventions.

(i) Preference for United States industry. Unless provided otherwise, no Contractor that receives title to any subject invention and no assignee of any such Contractor shall grant to any person the exclusive right to use or sell any subject invention in the United States unless such person agrees that any products embodying the subject invention will be manufactured substantially in the United States. However, in individual cases, the requirement may be waived by the Administrator upon a showing by the Contractor or assignee that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible.

(End of clause)

[**NOTE**: In order to advise offerors of the NASA patent waiver procedures set forth at 14 CFR Part 1245, subpart 1, NFS Section 1852.227-71 is used in all solicitations that include the clause at 1852.227-70, New Technology.]

Sec. 1852.227-71 Requests for waiver of rights to inventions.

As prescribed in 1827.303-70(c), insert the following provision in all solicitations that include the clause at 1852.227-70, New Technology:

Requests for Waiver of Rights to Inventions (Apr 1984)

(a) In accordance with the NASA Patent Waiver Regulations, 14 CFR part 1245, subpart 1, waiver of rights to any or all inventions made or that may be made under a NASA contract or subcontract with other than a small business firm or a domestic nonprofit organization may be requested at different time periods. Advance waiver of rights to any or all inventions that may be made under a contract or subcontract may be requested prior to the execution of the contract or subcontract, or within 30 days after execution by the selected contractor. In addition, waiver of rights to an identified invention made and reported under a contract or subcontract may be requested, even though a request for an advance waiver was not made or, if made, was not granted.

(b) Each request for waiver of rights shall be by petition to the Administrator and shall include an identification of the petitioner; place of business and address; if petitioner is represented by counsel, the name, address and telephone number of the counsel; the signature of the petitioner or authorized representative; and the date of signature. No specific forms need be used, but the request should contain a positive statement that waiver of rights is being requested under the NASA Patent Waiver Regulations; a clear indication of whether the request is for an advance waiver or for a waiver of rights for an individual identified invention; whether foreign rights are also requested and, if so, the countries, and a citation of the specific section or sections of the regulations under which such rights are requested; and the name, address, and telephone number of the party with whom to communicate when the request is acted upon. Requests for advance waiver of rights should, preferably, be included with the proposal, but in any event in advance of negotiations.

(c) Petitions for advance waiver, prior to contract execution, must be submitted to the Contracting Officer. All other petitions will be submitted to the Patent Representative designated in the contract.

(d) Petitions submitted with proposals selected for negotiation of a contract will be forwarded by the Contracting Officer to the installation Patent Counsel for processing and then to the Inventions and Contributions Board. The Board will consider these petitions and where the Board makes the findings to support the waiver, the Board will recommend to the Administrator that waiver be granted, and will notify the petitioner and the Contracting Officer of the Administrator's determination. The Contracting

Officer will be informed by the Board whenever there is insufficient time or information or other reasons to permit a decision to be made without unduly delaying the execution of the contract. In the latter event, the petitioner will be so notified by the Contracting Officer. All other petitions will be processed by installation Patent Counsel and forwarded to the Board. The Board shall notify the petitioner of its action and if waiver is granted, the conditions, reservations, and obligations thereof will be included in the Instrument of Waiver. Whenever the Board notifies a petitioner of a recommendation adverse to, or different from, the waiver requested, the petitioner may request reconsideration under procedures set forth in the Regulations.

(End of provision)

[**NOTE**: NFS Section 1852.227-70 is used in all solicitations and contracts containing either of the clauses at FAR 52.227-11, Patent Rights--Retention by the Contractor (Short Form) or 1852.227-70, New Technology.]

Sec. 1852.227-72 Designation of new technology representative and patent representative.

As prescribed in 1827.303-70(d), insert the following clause:

Designation of New Technology Representative and Patent Representative (July 1997)

(a) For purposes of administration of the clause of this contract entitled ``New Technology'' or ``Patent Rights--Retention by the Contractor (Short Form),'' whichever is included, the following named representatives are hereby designated by the Contracting Officer to administer such clause:

Title	Office code	Address (including zip code)
New Technology Representative		
Patent Representative		

(b) Reports of reportable items, and disclosure of subject inventions, interim reports, final reports, utilization reports, and other reports required by the clause, as well as any correspondence with respect to such matters, should be directed to the New Technology Representative unless transmitted in response to correspondence or request from the Patent Representative. Inquiries or requests regarding disposition of rights, election of rights, or related matters should be directed to the Patent Representative. This clause shall be included in any subcontract hereunder requiring a ``New Technology'' clause or ``Patent Rights--Retention by the Contractor (Short Form)'' clause, unless otherwise authorized or directed by the Contracting Officer. The respective responsibilities and authorities of the above-named representatives are set forth in 1827.305-370 of the NASA FAR Supplement.

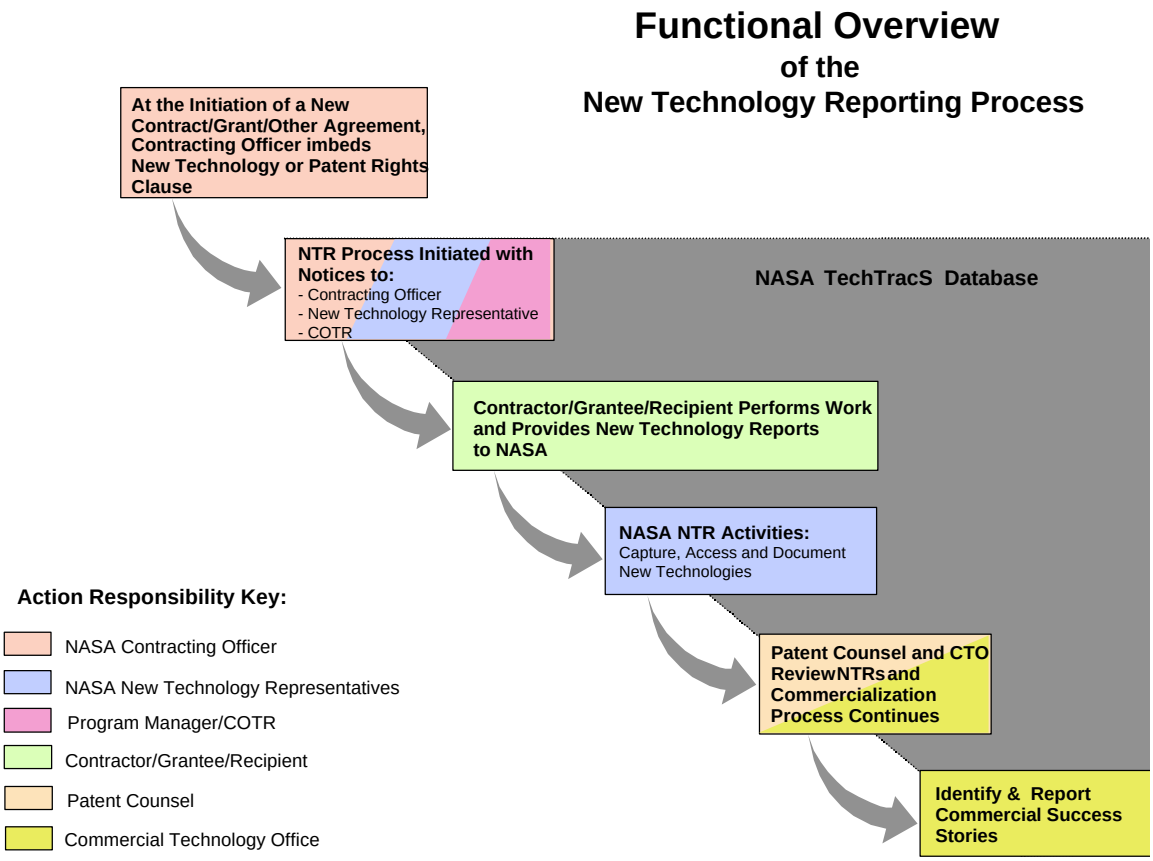
(End of clause)

Appendix E

New Technology Reporting Process

In general, the Government owns inventions made by its employees as a result of their employment. Executive Order 10096, as amended, governs the treatment of innovations and new technology arising from the work of Government employees. The Executive Order's implementing regulations are published at 37 CFR Part 501. In accordance with the Executive Order, its implementing regulations, and NASA Policy Directive (NPD) 2091.1 "Inventions Made By Government Employees," each employee who makes an invention is required to submit to the Office of the General Counsel, or to the delegated Center Patent Counsel, a disclosure of such invention.

The Government may also own, or obtain title to, inventions made under NASA contracts, grants and cooperative agreements. Contract requirements are provided in the Federal Acquisition Regulations (FAR) (CFR Title 48 Chapter 1) and the NASA FAR Supplement (NFS) (CFR Title 48 Chapter 18). Applicable FAR and NFS clauses are reproduced in Appendix C and D. Grants and cooperative agreements with institutions of higher education, hospitals, and non-profit organizations are addressed in 14 CFR Part 1260. Cooperative agreements with commercial firms are addressed in 14 CFR Part 1274. The provisions of 14 CFR Parts 1260 and 1274 are reproduced in NPG 5800.1D, the Grant and Cooperative Agreement Handbook, which may be accessed at http://procure.msfc.nasa.gov/grcover.htm. Generally, the rules apply equally to contracts, grants and cooperative agreements, and to subcontracts thereunder.



NASA's policy with respect to any invention made in the performance of experimental, developmental, or research work with small business firms, colleges, universities, and nonprofit organizations is based on the Bayh-Dole Act, as amended (35 U.S.C. 200 et. seq.; 37 CFR Part 401). The Bayh-Dole Act allows small business firms, colleges, universities, and nonprofit organizations to elect to retain title to inventions made under a funding agreement with a Federal agency that is funded in whole or in part by the Federal Government. A funding agreement is defined as a contract, grant, or cooperative agreement for the performance of experimental, developmental, or research work and includes any subcontract thereunder.

Based on the Bayh-Dole Act, the Patent Rights clauses at FAR 52.227-11, or at 14 CFR 1260.28 and 1274.913, as applicable, are included in contracts, subcontracts, grants and cooperative agreements (hereinafter referred to as contracts) with small business firms, colleges, universities, and nonprofit organizations for the performance of experimental, developmental, or research work. Under the Patent Rights clause the contractor, subcontractor, grantee or recipient (hereinafter referred to as contractor), must:

- Disclose each "Subject Invention" to the Federal agency (by way of the New Technology Representative identified in NFS Section 1852.227-72 or the clause at 14 CFR 1274.906 included in the contract) within 2 months after the inventor discloses it in writing to contractor personnel responsible for patent matters (A "Subject Invention" is defined in the Patent Rights clause to mean any invention or discovery of the contractor, which is or may be patentable or otherwise protectable under title 35 of the United States Code, conceived or first actually reduced to practice in the performance of work under the contract);
- Elect in writing whether or not to retain title to any such invention by notifying the Federal agency within 2 years of disclosure to the Federal agency, except, in any case where publication, sale, or public use has initiated the 1 year statutory period wherein valid patent protection can still be obtained in the United States, the period for election of title may be shortened by the agency to a date that is no more than 60 days prior to the end of the statutory period; and
- File its initial patent application on a subject invention to which it elects to retain title within 1 year after election of title, or, if earlier, prior to the end of any statutory period wherein valid patent protection can be obtained in the United States after a publication, sale, or public use.

The Government has the right to receive title to subject inventions, upon written request:

- If the contractor has not disclosed the invention within the time specified in the clause;
- In any country where the contractor does not elect to retain rights or fails to elect to retain rights to the invention within the time specified in the clause;
- In any country where the contractor has not filed a patent application within the time specified in the clause;
- In any country where the contractor decides not to continue prosecution of a patent application, pay maintenance fees, or defend in a reexamination or opposition proceeding on the patent; and
- In any country where the contractor no longer desires to retain title.

Once title vests in NASA, NASA may file patent applications and license the applications and any resulting patents obtained.

NASA's policy with respect to any invention, discovery, improvement, or innovation made in the performance of work under any NASA contract, subcontract, grant or cooperative agreement with other than a small business firm, college, university, or nonprofit organization (i.e., large businesses) and the allocation of related property rights is based upon Section 305 of the Space Act (42 U.S.C. 2457). Under any NASA contract, subcontract, grant or cooperative agreement with a large business, title to subject inventions vests in NASA when the invention was made by an employee of the contractor, subcontractor, grantee or recipient as a result of, or is related to, work under the NASA contract, subcontract, grant or cooperative agreement. The Administrator may grant a waiver of title in accordance with 14 CFR Section 1245. For NASA contracts, subcontracts, grants or cooperative agreements with large businesses, it is the policy of NASA to waive the rights of the United States to acquire title in and to any subject invention (with the reservation of a Government license as set forth in FAR 27.302(c) and the march-in rights of FAR 27.302(f) and 1827.302(f)) if the Administrator determines that the interests of the United States will be served.

Based on the Space Act, the New Technology clauses at NFS 1852.227-70 or 14 CFR 1274.912, as applicable, are included in all NASA contracts, subcontracts, grants or cooperative agreements (hereinafter referred to as contracts) with large businesses if the contract is to be performed in the United States, its possessions, or Puerto Rico and has as a purpose the performance of experimental, developmental, research, design, or engineering work. Under the New Technology clauses, to obtain title to the invention, the contractor, subcontractor, grantee, or recipient (hereinafter referred to as contractor) must:

- Disclose each "Reportable Item" to the Contracting/Grant Officer (by way of the New Technology Representative identified in NFS Section 1852.227-72 or the clause at 14 CFR 1274.906 included in the contract) within two

months after the inventor discloses it in writing to Contractor personnel responsible for the administration of this New Technology clause or, if earlier, within six months after the Contractor becomes aware that a reportable item has been made (A "Reportable Item" is defined in the New Technology clause to mean any invention, discovery, improvement, or innovation of the Contractor, whether or not the same is or may be patentable or otherwise protectable under Title 35 of the United States Code, conceived or first actually reduced to practice in the performance of any work under the contract or in the performance of any work that is reimbursable under any clause in the contract providing for reimbursement of costs incurred prior to the effective date of the contract);
- Either prior to execution of the contract or within 30 days after execution of the contract, petition for advance waiver of rights to any or all of the inventions that may be made under a contract, or if such a petition is not submitted (or if an advance waiver is denied) petition for waiver of rights to an identified invention within eight months of first disclosure of invention to the Federal agency; and
- File its initial patent application on an invention to which it obtains title within 1 year after NASA grants the waiver (see 14 CFR 1245.109 the NASA Waiver Regulations).

If the contractor fails to disclose, request waiver, or file a patent application in accordance with the contract (or if a waiver is denied), the Government retains title to the invention. Once title vests in NASA, NASA may file patent applications and license the applications and any resulting patents obtained.

Many commercially valuable technological advances have resulted from innovations developed under NASA contracts for experimental, development and research work. In order for NASA to achieve its goal of providing the widest practicable and appropriate dissemination, early utilization, expeditious development, and continued availability for the benefit of the scientific, industrial, and commercial communities and the general public, NASA must be able to identify and monitor such technologies, and assert intellectual property rights if appropriate. Therefore, the Technology Reporting requirements in NASA contracts require that contractors provide NASA:

- "New Technology Reports" disclosing each reportable item (New Technology clause) or subject invention (Patent Rights clause) developed under the contract to NASA within two months after the inventor discloses it in writing to Contractor;
- "Interim Reports" every 12 months from the date of the contract listing all reportable items or subject inventions required to be disclosed during the reporting period, or certifying that there were none; and
- A "Final Report" prior to contract closeout listing all reportable items or subject inventions developed during performance of the contract, or certifying that there were none.

New Technology Reports are the primary means for identifying inventions and innovations developed under NASA contracts. The Agency is prevented from achieving full success in its commercial technology mission when innovations are not identified or reports are not submitted in a timely manner. Moreover, the Agency (and each Center) may be losing the benefit of royalty income received from the licensing of patents on inventions and innovations which NASA has funded, but has lost, through the contractor's failure to report.

It is important that the Government and the contractor know, protect, and exercise their rights in inventions, discoveries, improvements, and innovations made in the performance of work under NASA contracts in order to ensure their expeditious availability to the public; foster commercial use; enable the Government, its contractors, and the public to avoid unnecessary payment of royalties; and defend themselves against claims and suits for infringement. To attain these ends, contracts having the New Technology clause or the Patent Rights clause should be so administered that:

- Reportable items and subject inventions are identified, disclosed, and reported as required by the clause, and requests for waiver of title or election of title, when appropriate, are timely made;
- The rights of the Government in reportable items and subject inventions are established;
- Where patent protection is appropriate, patent applications are timely filed and prosecuted;
- The rights of the Government in filed patent applications are documented by formal instruments such as licenses or assignments; and
- Expeditious commercial utilization of reportable items and subject inventions is achieved.

For each contract containing the New Technology clause or the Patent Rights clause, NFS 1852.227-72 or the clause at 14 CFR 1274.906, Designation of New Technology Representative and Patent Representative, will be included in the

contract to identify the representatives that administer the clause, protect the Government's rights, and take other actions in relation thereto. Normally, the New Technology Representative will be the Technology Utilization Officer or the staff member (by titled position) having cognizance of technology utilization matters for the Center concerned; and the Patent Representative will be the Patent Counsel (by titled position) having cognizance of patent matters for the Center concerned. In accordance with NFS 1852.227-72 and 14 CFR 1274.906, reports of reportable items, and disclosure of subject inventions, interim reports, final reports, utilization reports, and other reports required by the New Technology or Patent Rights clause, as well as any correspondence with respect to such matters, should be directed to the New Technology Representative unless transmitted in response to correspondence or request from the Patent Representative. Inquiries or requests regarding disposition of rights, election of rights, or related matters should be directed to the Patent Representative.

For each contract containing the Patent Rights clause or the New Technology clause , the following NASA officials will take the listed actions (refer to the New Technology Reporting Process flowchart).

The New Technology Representative shall take the following actions:

- Review the technical progress of work performed under the contract to ascertain whether the contractor is complying with the clause's reporting requirements;
- Receive New Technology, Interim and Final Reports from the contractor and determine, in consultation with the Contracting Officer's Technical Representative (COTR) or Program Manager, whether submitted reports are acceptable;
- Request that the contractor submit Interim and/ or Final Reports if not timely submitted;
- Forward to the Patent Representative copies of all New Technology Reports submitted by the contractor;
- Forward to the Patent Representative all correspondence relating to inventions and waivers under the New Technology clause or election of title under the Patent Rights clause;
- Enter New Technology Reporting information into NASA TechTracS;
- After consulting the COTR or Program Manager, request that the contractor reconsider and resubmit Interim Reports deemed to be incomplete;
- After consulting the COTR or Program Manager, request that the contractor submit any New Technology Reports listed on Interim or Final Reports that have not been previously submitted;
- Upon receipt of any final report required by the clause, and upon determination that all work is complete, determine whether the contractor has complied with the clause's reporting requirements. If so, the New Technology Representative shall certify compliance, obtain the Patent Representative's concurrence, and forward the certification to the contracting/grants officer.

The Contracting Officer's Technical Representative (COTR) or Program Manager shall take the following actions:

- Monitor the technical progress of work performed under the contract to ascertain whether the contractor is complying with the clause's reporting requirements; and
- Review all Interim and Final Reports to determine whether all expected reportable items or subject inventions have been disclosed and provide input to the New Technology Representative.

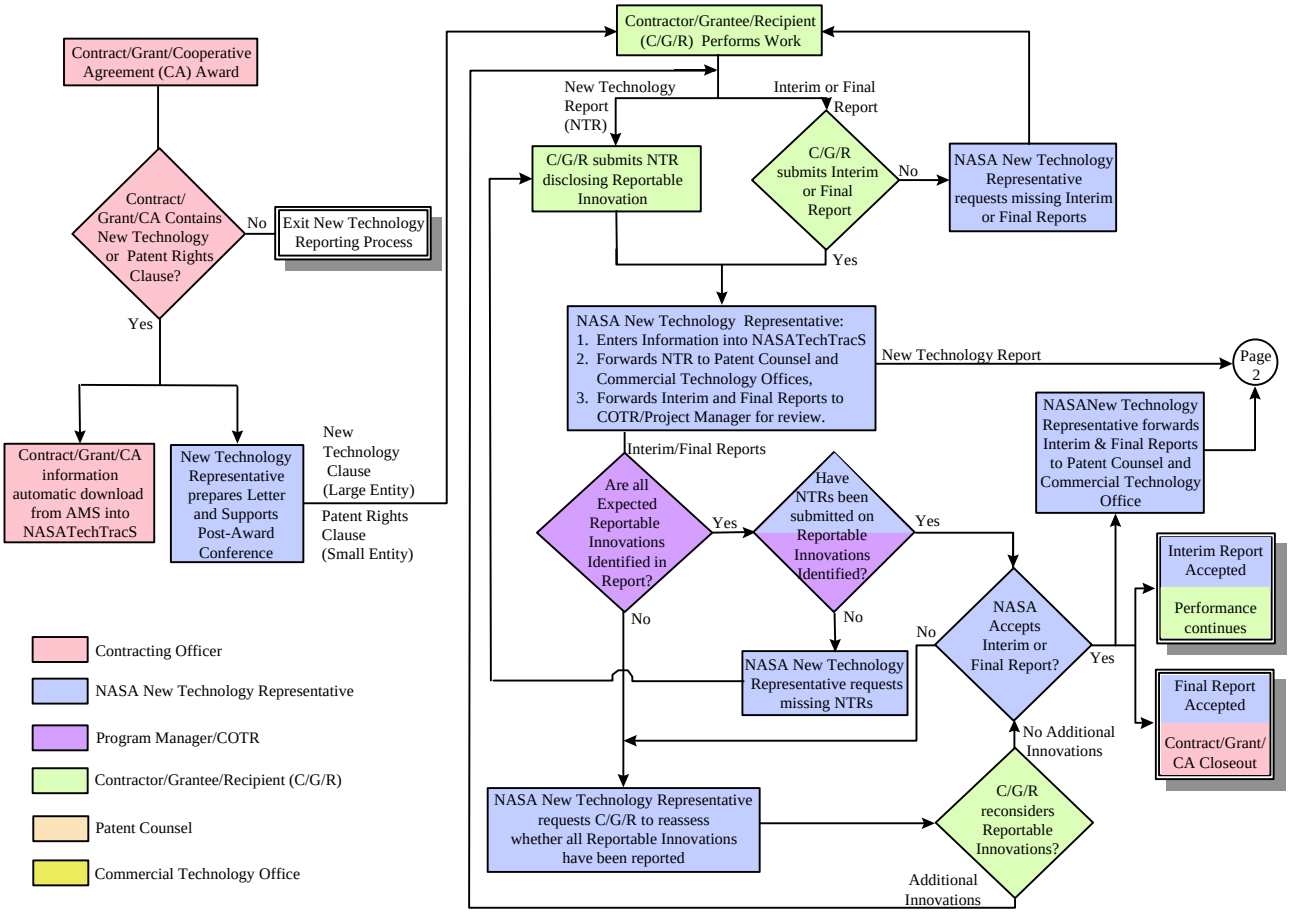
The Patent Representative shall take the following actions:

- Review each reportable item to ascertain whether it is to be considered a subject invention, and obtain any determinations required by paragraph (b) of the New Technology clause;
- Review New Technology Reports to ensure that the contractor has provided sufficient information to protect the Government's rights and interests in it and to permit the preparation, filing, and prosecution of patent applications;
- Enter patent related information into NASA TechTracS;
- Determine inventorship and rights to intellectual property;
- Ensure the preparation of instruments establishing the Government's rights; and
- Determine when information disclosed in New Technology Reports may be publicly released and approve or deny requests for such public releases.

The Contracting Officer shall not approve release of final payment under the contract and, if applicable, any reserve set aside under the withholding provisions of the clause for deficiencies and delinquent reporting not corrected as of

the time of the submission of the final report by the contractor until receipt of the New Technology Representative's certification of compliance, and the Patent Representative's concurrence.

New Technology Reporting Process



New Technology Reporting Process
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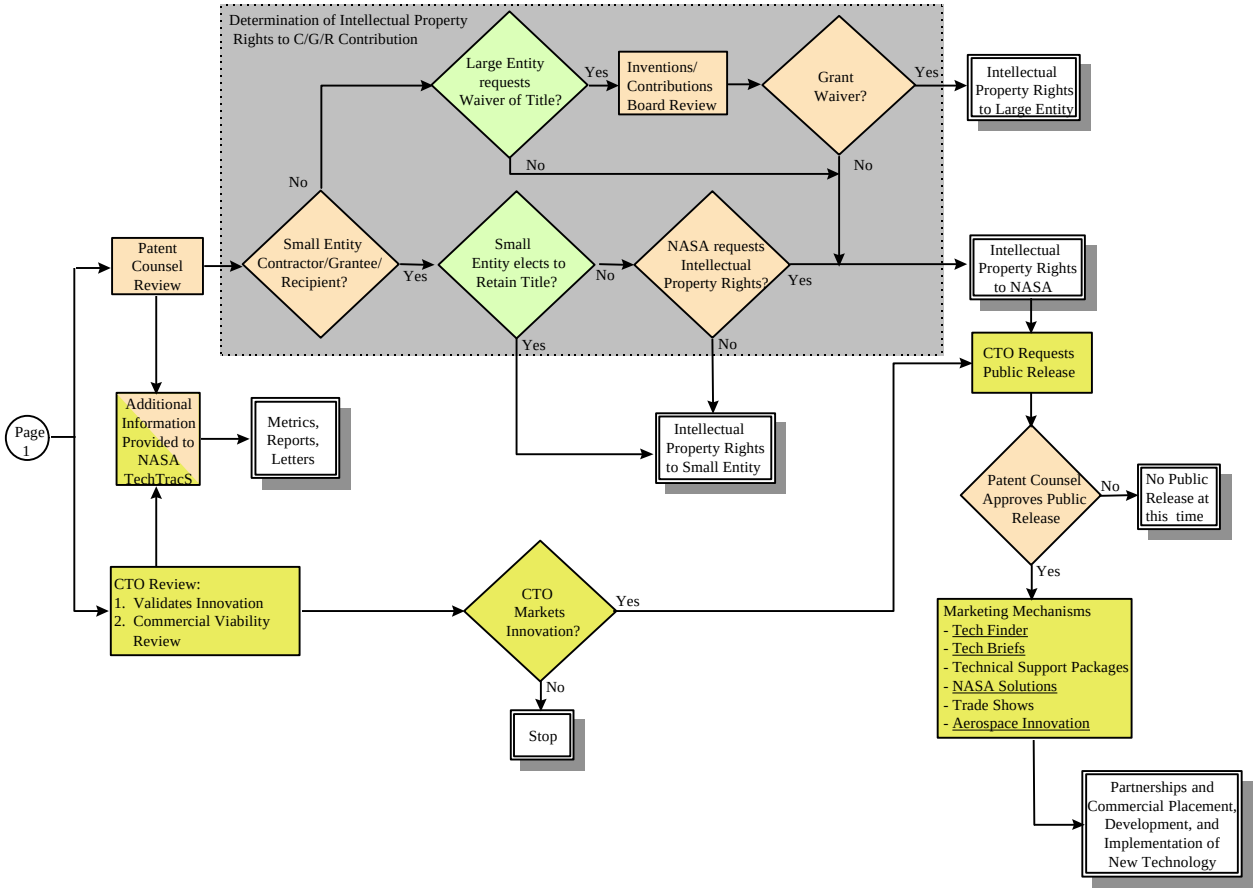


New Technology Reporting Process Definitions

Contract/Grant/CA - Contracts, Grants and Cooperative Agreements are the New Technology Reporting Process.

Small Entity - Small Business Firms, Colleges, Universities, and Organizations are all considered Small Entities. Grants, and Cooperative Agreements wirh Small include the Patent Rights Clause required under the Bayh-Dole

Large Entity - Everything other than Small Business Firms, Colleges, orNonprofit Organizations (basically, Large Business Firms) are considered Large Entities. Contracts, Grants, and Agreements with Large Entities include the New Technology required under the National Aeronautics and Space Act of

Reportable Innovation - Reportable Innovations include: (1) Subject Inventions under Patent Rights Clause for Small Entities; and (2) Reportable under the New Technology Clause for Large

NTR - A New Technology Report (NTR) is a detailed disclosure of individual Reportable Item. Contractors, Grantees and in Cooperative Agreements preferably disclose Reportable on NASA Form 1679.

Interim/Final Reports An Interim Report shall be provided every 12 months from the date of listing Reportable Innovations during that period, or certifying that there were A Final Report shall be provided prior to contract closeout, listing all Innovations, or certifying that there were

National Aeronautics and Space Administration

Disclosure of Invention and New Technology (Including Software)

Form Approved O.M.B. NO. 2700-0009	DATE
NT CONTROL NO. (OFFICIAL USE ONLY)	

This is an important legal document. Carefully complete and forward to the Patent Representative (NASA in-house innovation) or New Technology Representative (contractor/grantee innovation) at NASA. Use of this report form by contractor/grantee is optional; however, an alternative format must at a minimum contain the information required herein. NASA in-house disclosures should be read, understood and signed by a technically competent witness in the witness signature block at the end of this form.

In completing each section, use whatever detail deemed appropriate for a "full and complete disclosure." Contractors/Grantees please refer to the New Technology or Patent Rights - Retention by the Contractor clauses. When necessary, attach additional documentation to provide a full, detailed description.

1. DESCRIPTIVE TITLE

2. INNOVATOR(S) *(Name(s), Title(s), Phone Number(s), Home Address(es). For non U.S. citizen, include INS Form I-551 No. and expiration date. If multiple innovators, please number.)*

3. EMPLOYER(S) WHEN INNOVATION MADE *(Name and Division)*

4. ADDRESS(ES) *(Place of performance)*

5. EMPLOYER STATUS *(choose one for each innovator)*

_____ Innovator #1 _____ Innovator #3

_____ Innovator #2 _____ Innovator #4

GE = Government
CU = College or University
NP = Non-Profit Organization
SB = Small Business Firm
LE = Large Entity

6. ORIGIN *(check all that apply and supply number(s))*

- ☐ NASA In-house Org. Code _____
- ☐ NASA Grant No. _____
- ☐ NASA Prime Contract No. _____
  Task No. _____ Report No. _____
- ☐ Subcontractor; Subcontract Tier _____
- ☐ Joint Effort *(NASA prime contractor and NASA in-house)*
- ☐ Multiple Contractor Contribution *(collaboration of prime contractor and subcontractor)*
- ☐ Other *(e.g., Space Act or Cooperative Agreement)* No. _____

UPN(s) _____
UPN(s) _____
UPN(s) _____
UPN(s) _____
UPN(s) _____
UPN(s) _____
UPN(s) _____

Contractor Reportable Item No. _____

7. NASA CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE *(COTR)*

8. CONTRACTOR/GRANTEE NEW TECHNOLOGY REPRESENTATIVE *(POC)*

9. BRIEF ABSTRACT *(A general description of the innovation which describes its capabilities, but does not reveal details that would enable duplication or imitation of the innovation.)*

SECTION I - DESCRIPTION OF THE PROBLEM OR OBJECTIVE THAT MOTIVATED THE INNOVATION'S DEVELOPMENT *(Enter as appropriate: A.- General description of problem/objective; B.- Key or unique problem characteristics; C.- Prior art, i.e., prior techniques, methods, materials, or devices performing function of the innovation, or previous means for performing function of software; and D.- Disadvantages or limitations of prior art.)*

SECTION II - TECHNICALLY COMPLETE AND EASILY UNDERSTANDABLE DESCRIPTION OF INNOVATION DEVELOPED TO SOLVE THE PROBLEM OR MEET THE OBJECTIVE *(Enter as appropriate; existing reports, if available, may form a part of the disclosure, and reference thereto can be made to complete this description: A.- Purpose and description of innovation/software; B.- Identification of component parts or steps, and explanation of mode of operation of innovation/software preferably referring to drawings, sketches, photographs, graphs, flow charts, and/or parts or ingredient lists illustrating the components; C.- Functional operation; D.- Alternate embodiments of the innovation/software; E.- Supportive theory; F.= Engineering specifications; G.- Peripheral equipment; and H.- Maintenance, reliability, safety factors.)*

SECTION III - UNIQUE OR NOVEL FEATURES OF THE INNOVATION AND THE RESULTS OR BENEFITS OF ITS APPLICATION *(Enter as appropriate: A.- Novel or unique features; B.- Advantages of innovation/software; C.- Development or new conceptual problems; D.- Test data and source of error; E.- Analysis of capabilities; and F.- For software, any re-use or re-engineering of existing code, use of shareware, or use of code owned by a non-federal entity.)*

SECTION IV - SPECULATION REGARDING POTENTIAL COMMERCIAL APPLICATIONS AND POINTS OF CONTACT *(including names of companies producing or using similar products)*

10. ADDITIONAL DOCUMENTATION *(Include copies or list below any pertinent documentation which aids in the understanding or application of the innovation (e.g., articles, contractor reports, engineering specs, assembly/manufacturing drawings, parts or ingredients list, operating manuals, test data, assembly/manufacturing procedures, etc.)*

TITLE	PAGE	DATE
Appendix F		
Appendix H		

11. DEGREE OF TECHNOLOGICAL SIGNIFICIANCE *(Which best expresses the degree of technological significance of this innovation?)*

☐ Modification to Existing Technology ☐ Substantial Advancement in the Art ☐ _____

12. STATE OF DEVELOPMENT

☐ Concept Only ☐ Design ☐ Prototype ☐ Modification ☐ Production Model ☐ Used in Current Work

13. PATENT STATUS *(Prior patent on/or related to this innovation)*

☐ Application Filed Application No. _____ Application Date _____

☐ Patent Issued Patent No. _____ Issue Date _____

14. INDICATE THE DATES OR THE APPROXIMATE TIME PERIOD DURING WHICH THIS INNOVATION WAS DEVELOPED *(i.e., conceived, constructed, tested, etc.)*

15. PREVIOUS OR CONTEMPLATED PUBLICATION OR PUBLIC DISCLOSURE INCLUDING DATES *(Provide as applicable: A.- Type of publication or disclosure, e.g., report, conference or seminar, oral presentation; B.- Disclosure by NASA or Contractor/Grantee; and C.- Title, volume no., page no., and date of publication.)*

16. QUESTIONS FOR SOFTWARE ONLY

(a.) Using outsiders to beta-test code? ☐ YES ☐ NO If Yes, done under beta-test agreement? ☐ YES ☐ NO

(b.) Modifications to this software continue by civil servant and/or contractual agreement? ☐ YES ☐ NO

(c.) Previously copyrighted? ☐ YES ☐ NO ☐ UNKNOWN If copyrighted, then by whom? _____

(d.) Were prior versions distributed? ☐ YES ☐ NO If Yes, supply NASA or Contractor contact: _____

(e.) Contains or is based on code owned by a non-federal entity? ☐ YES ☐ NO ☐ UNKNOWN

If Yes, has a license for use been obtained? ☐ YES ☐ NO ☐ UNKNOWN

(f.) Has the latest version been distributed without restrictions as to use or disclosure for more than one year?

☐ YES ☐ NO ☐ UNKNOWN If Yes, date of disclosure: _____

17. DEVELOPMENT HISTORY

STAGE OF DEVELOPMENT	DATE (M/Y)	LOCATION	IDENTIFY SUPPORTING WITNESSES (NASA in-house only)
a. First disclosure to others			
b. First sketch, drawing, logic chart or code			
c. First written description			
d. Completion of first model of full size device *(invention)* or beta version *(software)*			
e. First successful operational test *(invention)* or alpha version *(software)*			

f. Contribution of innovators *(If jointly developed, provide the contribution of each innovator)*

g. Indicate any past, present, or contemplated government use of the innovation

18. SIGNATURE(S) OF INNOVATOR(S), WITNESS(ES), AND NASA APPROVAL

TYPED NAME AND SIGNATURE *(Innovator #1)*	DATE	TYPED NAME AND SIGNATURE *(Innovator #2)*	DATE
TYPED NAME AND SIGNATURE *(Innovator #3)*	DATE	TYPED NAME AND SIGNATURE *(Innovator #4)*	DATE
TYPED NAME AND SIGNATURE *(Witness #1)*	DATE	TYPED NAME AND SIGNATURE *(Witness #2)*	DATE

NASA APPROVED ▶	TYPED NAME	SIGNATURE	DATE

Appendix G

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONTRACT NO. NAS 7-918

TECHNICAL SUPPORT PACKAGE

On

Microscopic Heat Exchangers, Valves, Pumps, and Flow Meters

for July 98

NASA TECH BRIEF Vol. 22, No. 7, Item #

from

JPL NEW TECHNOLOGY REPORT NPO-19093

Inventor(s):

Frank T Hartley

TSP assembled by:
JPL Technology Reporting Office

pp. i, 1-4

JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

July 98

Microscopic Heat Exchangers, Valves, Pumps, and Flowmeters

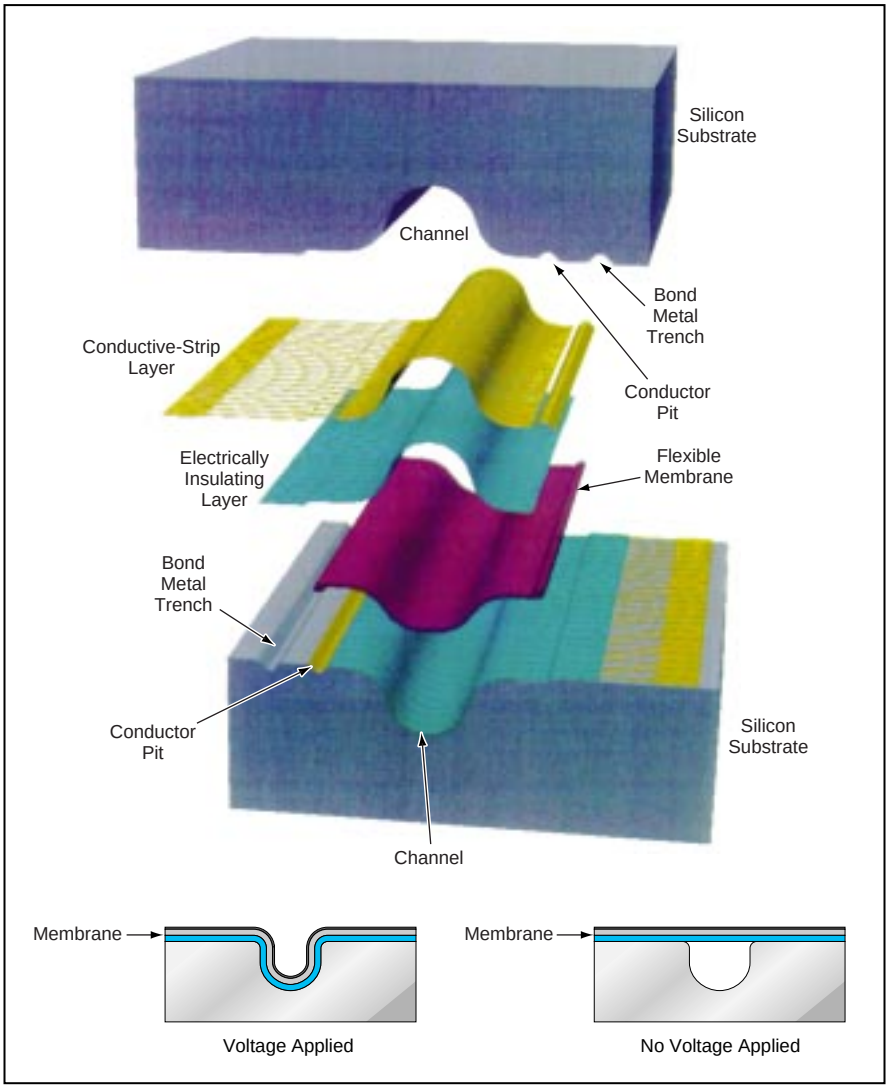
Forced-flow heat-transfer systems would be made by micromachining.

NASA's Jet Propulsion Laboratory, Pasadena, California

Microscopic forced-flow heat-transfer systems containing heat exchangers, flow channels, electrostatically driven peristaltic pumps, and related components have been proposed. These systems would be made largely of silicon, by use of micromachining processes similar or identical to those used to make integrated circuits. These microscopic heat-transfer systems could thus be made as integral parts of integrated circuits: For example, charge-coupled-device (CCD) imaging circuits in infrared cameras could be cooled very effectively by incorporating such systems to circulate cryogenic fluids within the CCD substrates.

The figure illustrates a dual-cavity push-pull embodiment of an electrostatically driven peristaltic pump. The pump channels would be etched into silicon substrates, which are bonded together with an electrically conductive flexible membrane sandwiched between them. The channels would be lined with electrically conductive strips covered with electrically insulating material and separated from each other by electrically insulating barriers. By applying a suitable voltage between the membrane and the conductive strips of each channel in succession, one would cause the membrane to be electrostatically pulled into the channel at successive positions along the channel. Dual interlaced and interlocked shift registers enable alternate inversions of bit-stream sequences and multiple membrane "bubbles" that move down the channel, pushing entrapped fluid in front of each membrane "wall" and pulling the fluid behind each membrane "wall." This pump architecture represents a true two-dimensional analog of a peristaltic mechanism that is valveless, impervious to gas-bubble entrapment, does not require priming, and is self purging. The device is a digital pump that may be single-stepped to function as a valve or, by counting the number of clocked bits, is a precision flowmeter.

A heat exchanger consisting of micromachined channels in a thermally conductive material would be designed to maximize heat-transfer surface area and to provide effective convective coupling of heat between the pumped fluid and the channel surfaces at the expected flow speeds. The use of microscopic channels would make it possible to achieve low conduction and convection losses, with consequent high thermal coupling and short characteristic times for decay of thermal transients.



Electrostatic Attraction would be used to pull the flexible membrane into, across, and along the channels: this would generate peristaltic waves in the membrane to pump a fluid along the channel.

This work was done by Frank T. Hartley of Caltech for ***NASA's Jet Propulsion Laboratory****.*

This is the invention of a Caltech/JPL employee, and a patent application has been filed. Inquiries concerning license for its commercial development may be addressed to the inventor:

Frank Hartley
JPL
MS 125-177
4800 Oak Grove Drive
Pasadena, CA 91109
(818) 354-3139

Refer to NPO-19093.

1. Background

The sub-micron precision with which micro machining can define structural dimensions and etch stops can regulated layer thickness enables the fabrication of minutely scaled structures in which significant and reproducible electrostatic fields are generated by low voltages.

While prior art has addresses various electrostatic pumps, no implementation of a micro peristalic type pump has been addressed. Further, there has been no prior claim for the use of any micro pumping device to enhance convective heat transfer between a solid and a fluid.

2. Novelty

This proposed device provides the:

a. Method and apparatus for microscopic scale pumping of a liquid or vapor fluid.
b. Method and apparatus to increase convective heat flux by forced fluid flow through channels in silicon or other micro-machined solids.

3. Technical Disclosure

Problems

There is no known existing method of facilitating significant convective heat flux by the forced flow of fluids through micro channels within a solid. Nor is there a known effective pumping mechanism.

Solution

The disclosure consists of two parts; each of which is a significant innovation.

Firstly, micro machined channels in a thermally conductive material are constructed in such a way as to maximize the surface area. Fluid flow through these channels provides effective convective coupling with the channel surface. Precise control of duct size and the flow velocity provide for optimum heat transfer efficiency and operating conditions.

Secondly, a version of a micro machined pump is defined which is easily manufactures exhibits convenient electrical interfacing and exhibits an extensive range of flow rates.

Micro machining techniques have evolved from the microelectronics industry. Both the additive processes of thin film deposition or electroplating and the subtractive processes of chemical or plasma etching are appropriate for the manufacture of both the channels and pump.

The bulk anisotrophic etching of channels in silicon and its fusing to either a mirror image or a flat silicon wafer, is one technique of creating micro channels.

Surface micro machining may also be deployed where a patterned sacrifical profile of the channel is created over which the final mechanical structure material is deposited.

Isotropic etching techniques are required for a preferred implementation of the micro pump to create a smooth contoured concave channel. Once an insulation layer is created over the surface of the channel, a potential applied between the channel material and an electrically conductive flexible membrane will result in the progressive draw-down of the membrane into the channel. Breaking the channel up into a sequence of conductive strips and applying voltage to these strips sequentially provides a miniature peristalic pump. Over an extension range the flow rate of the pump is related to the progression rate of ‘strip’ excitations.

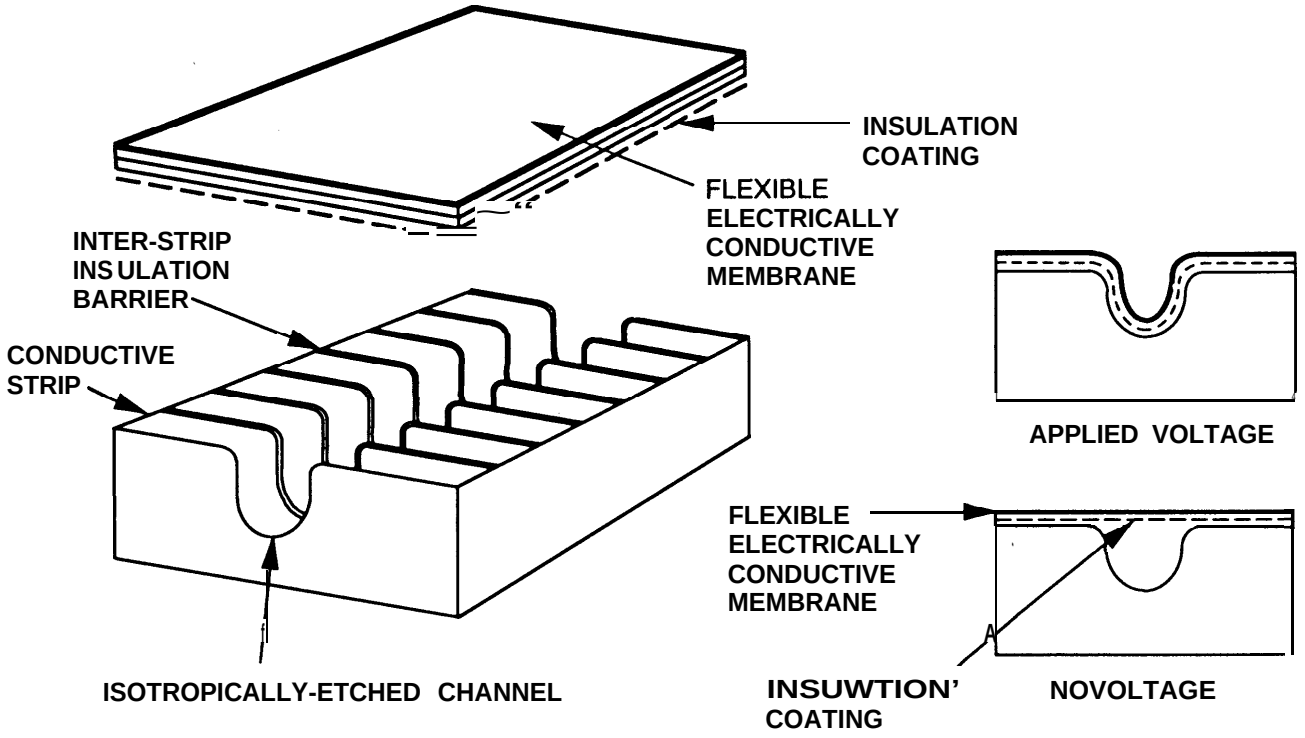
Description and Explanation

This disclosure relates to both novel adaptation of electro attractive mechanisms in micro structured devices that provides a miniature pump, and to the intimate thermal coupling (on a microscopic scale) between a solid substrate and a fast flowing fluid. The methods are relevant individually as well as collectively. A magneto attractive mechanism would also be appropriate for a miniature pump.

The advantages and some areas of application are as follows:

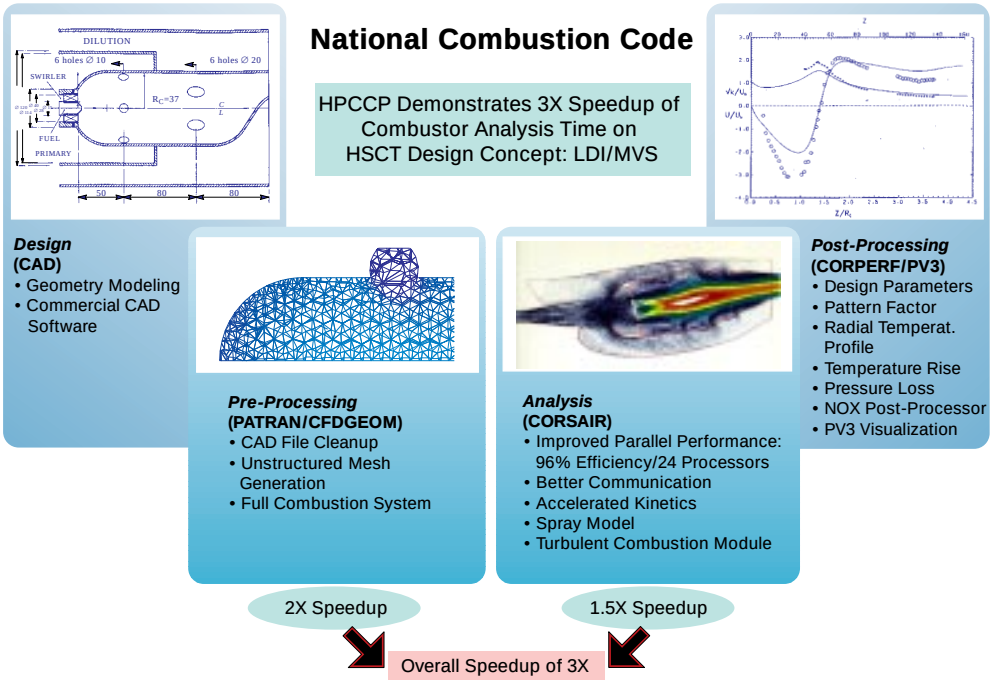
1. The miniature peristaltic pump can be used to transport fluids or vapors over an extensive range of flow rates.
2. The suggested implementation of the pump doubles as a positive displacement flow meter.
3. Micro dimensional solids exhibit small thermal conductive loss and micro dimensional channels exhibit small thermal conductive loss. This equates to small thermal time constants and high thermal coupling between solid and fluid.
4. Micro structured pump – channel implementation on a substrate, complete with drive electronics, results in a 'breathing skin' with a high thermal transfer coefficient. In a non-vacuum environment, such pumps draw from still air at the surface and expel away from the surface.
5. The heat pump is not dependent on density gradients and gravity field as are conventional convective heat sinks etc. They may therefore be used in space (i.e. Shuttle, Space Station)
6. With many pump channel cells per square centimeter the devices may be bonded to the surfaces of integrated circuit chips to dissipate their heat directly. No forced ventilation, no orientation constraints, no noise and no moving parts.
7. The pump channel cell substrate may be bonded to the surface of the power packs or system chassis in large area slabs to remove heat as an alternative to heat sinks or ducted air circulation.
8. The pumps may also be used for pumping cryogenic fluids to cool CCD's etc. in IR cameras. It could be an integrated part of the camera electronics.

29th December 1992
Frank T. Hartley.


INSULATION
COATING
FLEXIBLE
ELECTRICALLY
CONDUCTIVE
MEMBRANE
INTER-STRIP
INSULATION
BARRIER
CONDUCTIVE
STRIP
ISOTROPICALLY-ETCHED CHANNEL
APPLIED VOLTAGE
FLEXIBLE
ELECTRICALLY
CONDUCTIVE
MEMBRANE
INSUWTION'
COATING
NOVOLTAGE

Technology Opportunity

The National Combustion Code:
A Multidisciplinary Combustor Design System



A new software program - the National Combustor Code (NCC) - has been developed for aerospace and non-aerospace engineers and designers to enhance their understanding of physical and chemical processes which occur during continuous combustion. The NCC provides insight - for the first time - to the entire combustion process using a versatile and comprehensive set of tools.

The National Aeronautics and Space Administration (NASA) seeks to transfer this multidisciplinary combustor design system to U.S. companies for advanced liquid and gaseous continuous combustion applications. The NCC utilizes computer-aided design (CAD) tools for geometry creation, advanced mesh generators for creating solid model representations, a common framework for fluid flow and structural analyses, and powerful tools for post and parallel processing.

Potential Commercial Uses

- Evaluate the performance of current liquid and gas combustion systems leading to product improvement.
- Optimize the design of future liquid and gas combustion systems leading to increased performance and reliability.
- Examples of relevant liquid and gas combustion systems are:
  - Aviation gas turbine engines
  - Industrial/ground power gas turbines
  - Industrial combustion devices involving continuous burning of liquids and gaseous fuels
  - Hazardous waste incinerators
  - Steel treating furnaces
  - Domestic gas fired appliances

Benefits

- Product improvement for current combustion devices with respect to efficiency and durability
- Reduced time and costs for the design cycle of future combustion devices
- Optimized performance and reliability for future combustion devices

The Technology

The development of the National Combustion Code was pursued under a NASA/Department of Defense/Department of Energy/U.S. industry partnership. Recent efforts have been focused on developing a computational combustion dynamics capability that meets combustor designer requirements for model accuracy and analysis turnaround time, incorporating both short–term and long–term technology goals. As a first step, a baseline solver for turbulent combustion flows was developed under a joint modeling and code development effort between the Aero-Industry and the NASA Lewis Research Center. This baseline solver is a Navier–Stokes flow solver based on an explicit four-stage Runge–Kutta scheme that uses unstructured meshes and runs on networked workstations. The solver can be linked to any computer-aided design system via the Patran file system. Turbulence closure is obtained via the standard k–e model with a high Reynolds number wall function. The following combustion models have been implemented into the code: finite–rate reduced kinetics for Jet–A and methane fuels, turbulence–chemistry interactions via an assumed probability density function for temperature fluctuations, and thermal emissions of nitrogen oxides. The solver can switch between a parallel virtual machine (PVM) interface and a message-passing interface (MPI) by using compiler flags. Its parallel performance on several platforms has been analyzed, and on the basis of the results, several improvements have been made. To date, the baseline solver has been used in the following applications: simulation of swirling flow experiments, computation of a generic swirling flow can combustor, computation of a multi-shear low NOx fuel nozzle and calculation of a multi-walled production fuel nozzle, and calculation of a flame holder/Cyclone 1-cup sector.

Options for Commercialization

The executables of the National Combustor Code, Beta Version 2.0, and the corresponding nonproprietary source code will be available for release to the non-aerospace industry by summer 1999. Beginning in the summer of 1998, NASA would be willing to demonstrate the accuracy and reliability of the NCC by applying it to a wide range of areas where it would be helpful to have accurate predictions of the combustor process.

Contact

Gynelle Steele, Technology Utilization Engineer
NASA Lewis Commercial Technology Office
NASA Lewis Research Center
Cleveland, OH 44135
Phone: (216) 433-8258
FAX: (216) 433-5012
Email: Gsteele@lerc.nasa.gov

http://cto.lerc.nasa.gov

Dan DeMiglio, Client Services
Great Lakes Industrial Technology Center
Phone: (440) 734-1209
Fax: (440) 734-0686
Email: demiglio@battelle.org

Reference

CD number of the drawing is CD-97-74788

LEW16683-1

Appendix I

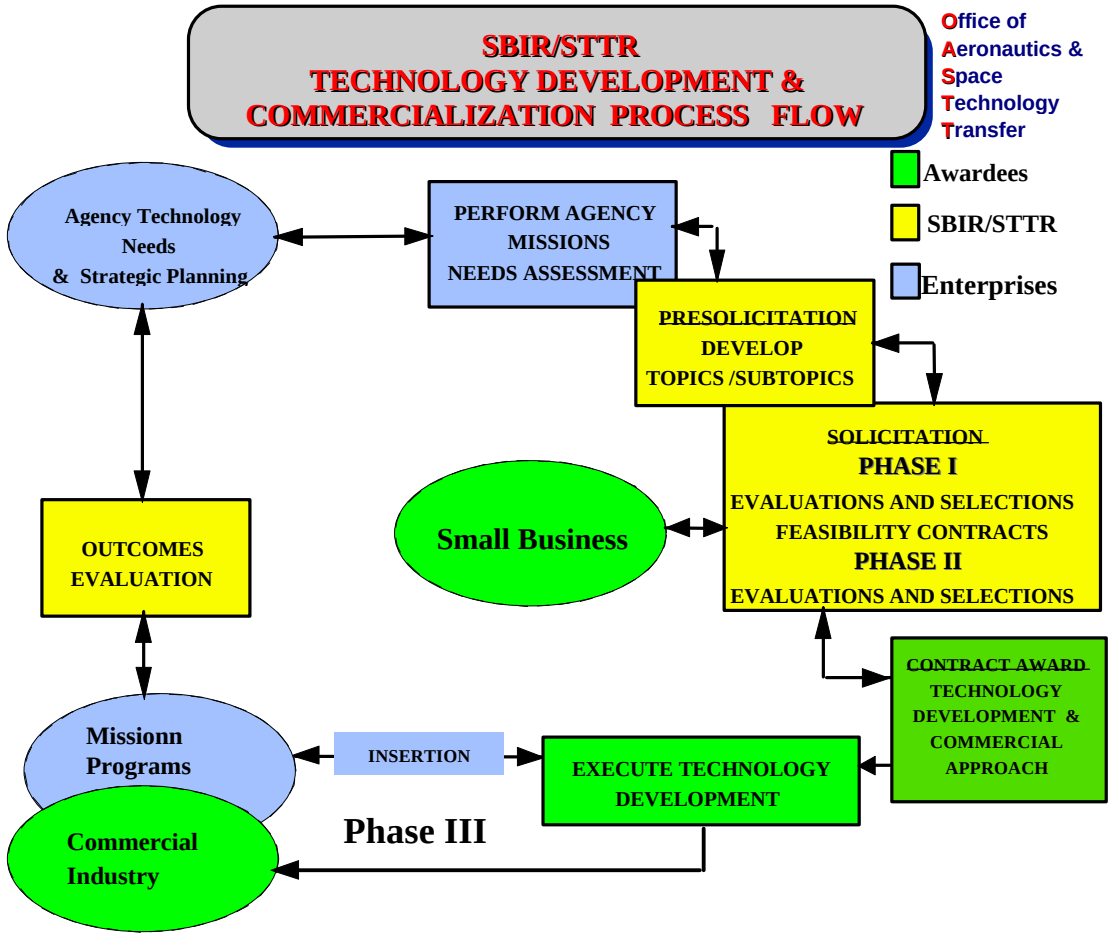
Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Models

The SBIR and STTR programs, (SBIR/STTR) are foundational models for the strategic development and implementation of technology commercialization in support of the overall NASA Commercial Technology Process.

Program Description

NASA invites eligible small business concerns to submit proposals annually for the SBIR/STTR programs. Through the solicited proposals, NASA seeks innovative concepts addressing mission program or focused technology needs described in the solicitation subtopics, but also offering high commercial application potential.

The structure of the SBIR/STTR programs reflects a three phase process to innovation, development and commercialization. These programs are implemented in Phases: Phase I provides the opportunity to establish feasibility and technical merit of a proposed innovation; in Phase II, the most promising Phase I projects are further developed; and in Phase III, the innovation, either a product or a service, is brought to commercial realization. Phases I and II utilize SBIR/STTR funds, while Phase III is capitalized by non-SBIR sources of government or private sector funding with the goal of achieving government or private sector sales.



SBIR/STTR Process Flow

As part of their strategic planning, NASA enterprises can identify appropriate technology development areas for inclusion in the SBIR/STTR solicitation's topic and subtopic descriptions. To be considered meritorious, an SBIR/STTR proposal must present an innovative solution to a technology challenge that meets a NASA enterprise mission need (developed during a strategic planning cycle), and also have the potential for successful commercial application.

Solicitation respondents are expected to thoroughly explain their innovation concept, method for demonstrating its feasibility and development, and identify a plan for pursuing Phase III commercial applications of the funded technology. Proposals emphasize near-term applicability to NASA. While final selection is made by the SBIR/STTR Source Selection Official, NASA Centers rate and rank proposals and provide recommendation lists. Selection preference is given to eligible proposals where innovations are judged to have significant potential for NASA enterprise programs and commercial application.

The NASA Office of Aeronautics and Space Technology Transfer provides, through the SBIR/STTR Program Executive Director, the overall policy direction for the SBIR/STTR program, while the NASA Goddard Space Flight Center serves as host for the Program Management Office. NASA Field Installations identify R&D needs, evaluate proposals, make recommendations for selections, and manage the individual projects.

SBIR/STTR contractors must have the capability to independently conduct the R&D they propose. During Phase I, contractors have a six month period in which to complete their Phase I projects and to submit their Phase I final reports and Phase II proposals.

Those contractors selected for Phase II follow-on, continue development of their innovations and provide at the conclusion of this phase, engineering prototypes and/or production ready products for use by NASA or the commercial world. Participation in Phase II is limited to those contractors who have completed SBIR/STTR Phase I projects. New fixed-price contracts are employed in Phase II, with performance periods of two years. On an average, NASA funds about 40 percent of the Phase II proposals submitted.

Phase III of the SBIR/STTR program provides an opportunity for NASA enterprises (or other federal agencies) to integrate into their core R&D missions, innovations developed under this program. Funding to the contractor in this phase must be non-SBIR/STTR. The SBIR/STTR contractor is also afforded an opportunity to develop his innovation into a commercial product. Commercial applications of this innovation must be funded through the private sector.

Appendix J

Example

Success Stories

NASA
Lewis
Success
Stories

Silicon Carbide for High Definition TV (HDTV) Transmitter Modules

Westinghouse Wireless Solutions

TECHNOLOGY

Silicon carbide is a high temperature, high voltage semiconductor, which can deliver greater than three times the power of conventional silicon devices.

COMMERCIAL APPLICATION

◆ Silicon carbide (SiC) based transmitters hold great promise for television stations as a transmitter technology as they convert from analog to digital broadcasting.

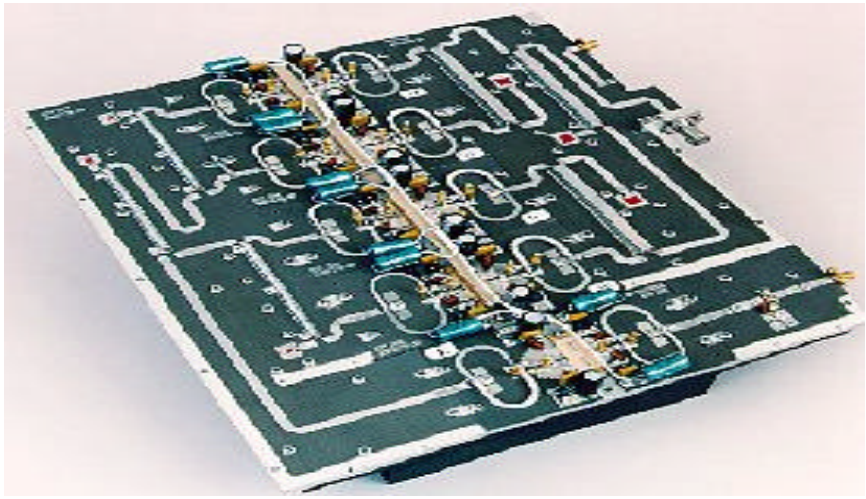
◆A modular solid state design provides broadcasters with an option to gradually add modules, increasing the power of their transmitters as they expand their HDTV coverage.

◆ Under a Space Act Agreement, NASA Lewis played a key role in the development of the base SiC epitaxial growth technology for Westinghouse's silicon carbide productization efforts.

SOCIAL / ECONOMIC BENEFIT

◆ Using these high power transistors will significantly reduce the space needed for high power transmitters at TV stations, and offer a solid state solution, reducing long term maintenance costs.

◆ Transmitter Manufacturers will be able to abandon their reliance on tube-based technology for high power transmitters and build smaller, higher power, solid state transmitters.



SiC Transmitter Module

NASA APPLICATIONS

◆ Silicon carbide's ability to function in high temperature, high power, and high radiation conditions will enable large performance enhancements in a variety of applications.

◆ The NASA Lewis High Temperature Integrated Electronics and Sensors (HTIES) Team is developing silicon carbide as a material for advanced semiconductor electronic device applications. SiC-based electronics and sensors can operate in hostile environments where conventional silicon-based electronics cannot function.

NASA Contact: Philip Newdeck
Company Contact: Jeff Jury

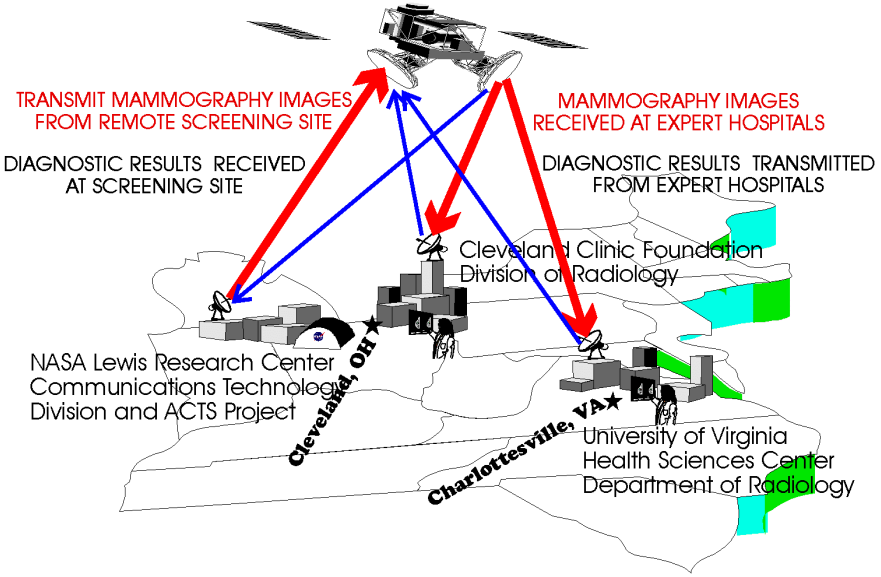
NASA
Lewis
Success
Stories

Satellite Transmission of Mammograms

Cleveland Clinic (CCF) and the University of Virginia

TECHNOLOGY

The Advanced Communications Technology Satellite (ACTS), pioneering new initiatives in communications satellite technology, is to deliver high quality, high resolution mammography images from served locations that need not have a terrestrial data communications infrastructure available. These images will be directed by satellite to the location of mammography experts.



Telemammography

COMMERCIAL APPLICATION

◆ The delivery of the images occurs in nearly real-time, using high data rate and globally accessible satellite networks currently being developed.

◆SOCIAL / ECONOMIC BENEFIT

◆ Patients in rural, urban, and low population density regions and economically depressed areas will be able to have mammography experts review their mammograms.

◆ Group mammography practices will likely be distributed throughout the country.

◆ Regional archiving and demographic databases will provide an abundance of data that could provide further insight into diseases affecting the breast.

NASA APPLICATIONS

◆ The Advanced Communications Technology Satellite (ACTS) provides for the development and flight test of high-risk, advanced communications satellite technology. Using advanced antenna beams and advanced on-board switching and processing systems, ACTS is pioneering new initiatives in communications satellite technology.

NASA Contact: Robert Bauer
Company Contact: Cleveland Clinic Found & University of Virginia

Appendix K

NASA COMMERCIAL TECHNOLOGY METRIC REPORT SUMMARY

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	NASA COMMERCIAL TECHNOLOGY METRIC REPORT SUMMARY BY ENTERPRISE																					
2		NASA ACTIVITY BASELINE (NAB)								REPORTABLE ITEMS									PARTNERSHIPS		SUCCESS STORIES	
3		Intra-Mural $$$	Extra-Mural $$$	Total Activities	Activities with Clause	% Reporting	% With Potential	No Potential Yet Identified	Not Yet Assessed	Extra-Mural Activities			Intra-Mural		Total FY98 Items	Total Active Items	% Available To Public	% With TSP/ TechBrief	# of Partnerships	Partnership %	SS Available to Public	# Success Stories
4										% With Reportable Item	FY 98 Extra-mural Items	Extra-mural Cumulative	FY98 Intramural Items	Intra-mural Last 5 yrs								
5	**NASA SUMMARY**																					
6	**FY98**		$ 12,050,778,132	17185	15341	NA	47.5%	34.1%	18.4%	18.3%	858	3907	311	1363	1169	5270	35.6%	30.1%	3936	35.3%	59	TBP
7	**FY99/Q1**																					
8	**FY99/Q2**																					
9	**FY99/Q3**																					
10	**FY99/Q4**																					
11	**AERO-SPACE TECHNOLOGY**																					
12	**FY98**		$ 1,313,233,114	3727	3399	NA	67.4%	13.1%	19.5%	19.7%	243	824	204	816	447	1640	5.8%	7.2%	1868	50.9%	39	TBP
13	**FY99/Q1**																					
14	**FY99/Q2**																					
15	**FY99/Q3**																					
16	**FY99/Q4**																					
17	**EARTH SCIENCE**																					
18	**FY98**		$ 1,746,912,662	3046	2808	NA	19.0%	46.0%	35.0%	3.9%	11	33	56	226	67	259	4.6%	0.4%	211	38.0%	1	TBP
19	**FY99/Q1**																					
20	**FY99/Q2**																					
21	**FY99/Q3**																					
22	**FY99/Q4**																					
23	**SPACE SCIENCE**																					
24	**FY98**		$ 1,803,641,559	4968	4862	NA	36.7%	31.3%	32.0%	10.7%	246	1303	0	0	246	1303	53.2%	52.3%	1370	70.1%	6	TBP
25	**FY99/Q1**																					
26	**FY99/Q2**																					
27	**FY99/Q3**																					
28	**FY99/Q4**																					
29	**HEDS**																					
30	**FY98**		$ 6,232,438,039	2531	1954	NA	60.15%	30.38%	9.47%	26.8%	103	1199	51	319	154	1518	41.6%	24.4%	278	3.3%	13	TBP
31	**FY99/Q1**																					
32	**FY99/Q2**																					
33	**FY99/Q3**																					
34	**FY99/Q4**																					
35	**OTHER**																					
36	**FY98**		$ 954,552,758	2913	2318	NA	10.0%	70.5%	19.5%	19.5%	255	549	0	2	255	551	23.0%	17.8%	209	30.3%	0	TBP
37	**FY99/Q1**																					
38	**FY99/Q2**																					
39	**FY99/Q3**																					
40	**FY99/Q4**																					